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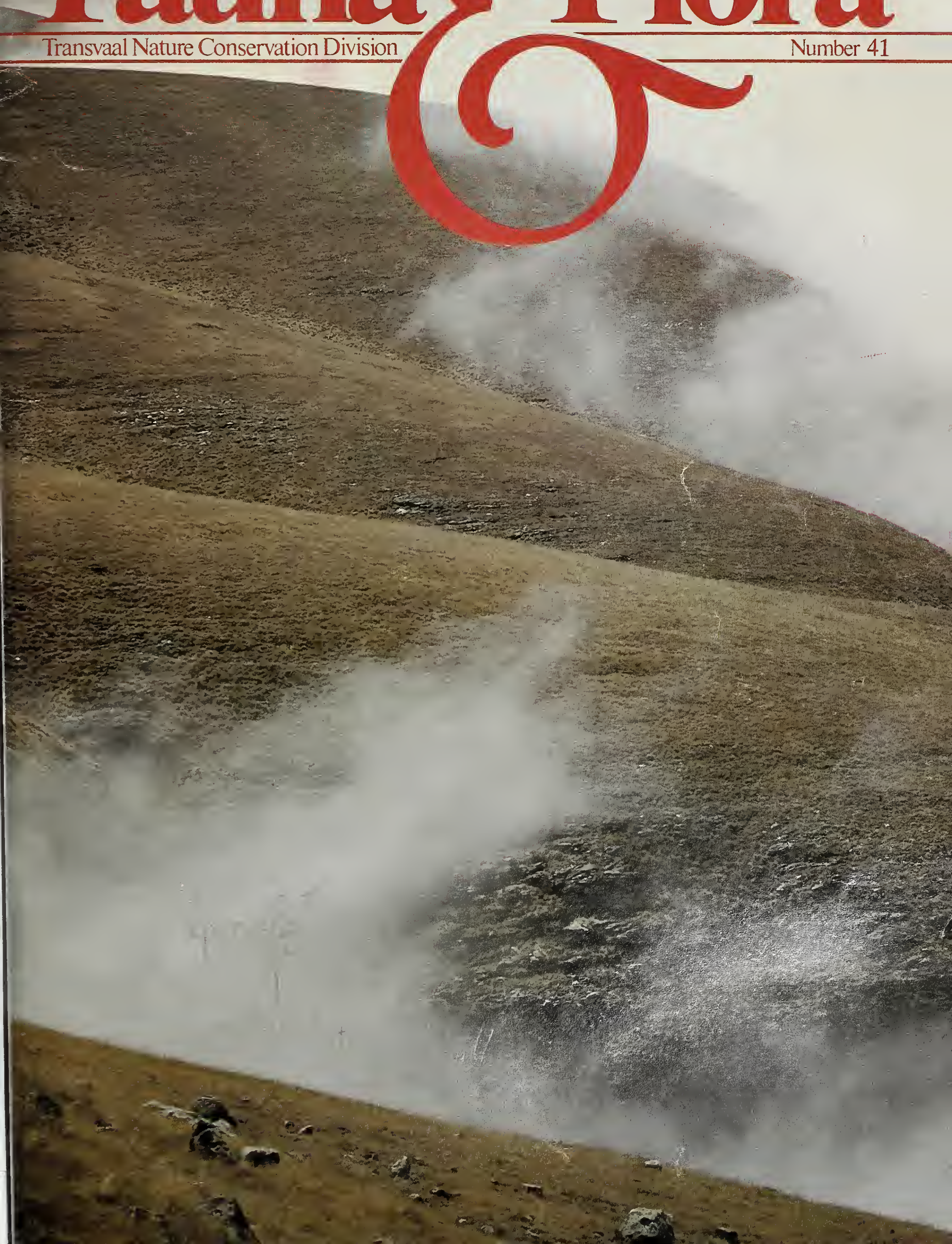
Fauna & Flora

Transvaal Nature Conservation Division

Number 41



Fauna & Flora

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Front cover: "One huge mass of rock, shrouded in eternal mist, ravaged by everlasting cold, without any natural beauty." Fortunately few people will today unreservedly endorse F. H. van Achterbergh's 1889 description of the Steenkampsberg. Photo by Peter Johnson Hon. FIP FBIPP FRPS

Back cover: Watsonias in the mist. Photo by Peter Johnson.

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THE STEENKAMPSBERG — A CONSERVATION PRIORITY

GARTH BATCHELOR

In this issue of *Fauna & Flora* we introduce you to a special part of the Transvaal. It is not known to many people since it does not lie on a tourist route, or feature in any visitors' guide. It is the rolling grassland country of the extreme north-eastern Highveld, locally known as the Steenkampsberg.

It is an area of high rainfall, very cold in winter and never very warm in summer, and its sponges and vleis provide the source of water for several large rivers such as the Elands and Crocodile. It is a remarkable area for wild flowers, as Hugh Cameron tells us further on. It has many interesting bird and reptile species, and is an important refuge for some such as the wattled crane and oribi, the numbers of which have declined so seriously in South Africa that they are now regarded as endangered species.

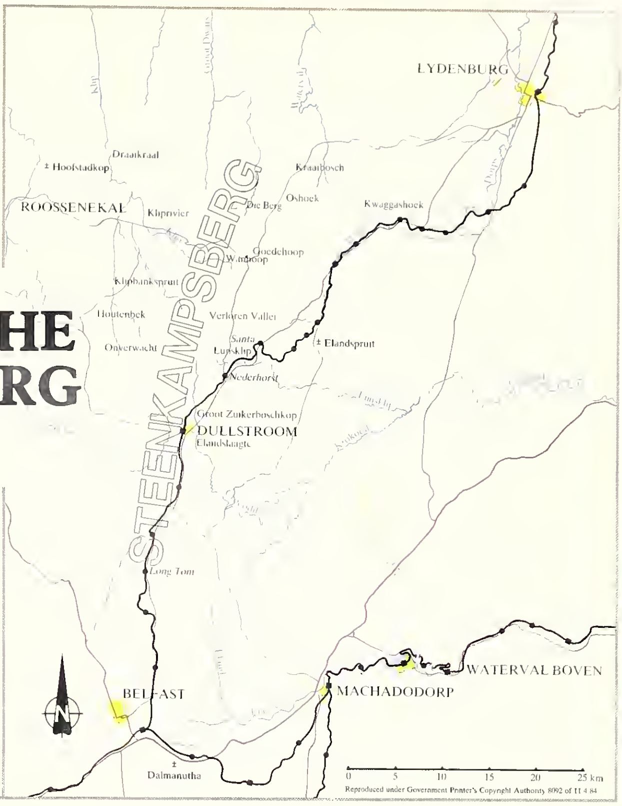
Professor Lombaard sketches the historical settlement and development of the Berg. Pastoral farming is the main form of land use today and this is the reason for the relatively pristine condition of much of the Berg, especially those parts where the cold conditions force farmers to trek their sheep elsewhere in winter. However two more recent developments, namely forestry and trout farming, are changing this. More than 4 000 ha of coniferous plantations now cover parts of the Berg. Interest in trout-farming is growing and the number of trout dams on the Berg exceeds two hundred. These developments are subtly but steadily changing the character of the Berg and, if unchecked, would ultimately extinguish the remaining populations of those rare species for which the Berg provides the last Transvaal refuge.

A compromise must be reached between man's immediate interests in the Steenkampsberg, and the long-term conservation of this floral and faunal gem. This issue of *Fauna & Flora* has been compiled to show what is at stake, and what may be lost forever if this compromise is not reached.

S. S. du Plessis
DIRECTOR OF NATURE CONSERVATION

SKETCHES OF THE STEENKAMPSBERG

B. V. Lombaard Ph.D., D.Sc.



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JOHN BAKKER

THE BERG GETS ITS NAME

THE European occupation of the Steenkampsberg followed soon after the Great Trek and virtually terminated its northward migration with the founding of Ohrigstad in 1845.

During their sojourn in Potchefstroom Commandant Hendrik Potgieter and his followers were still looking for land north of 25° latitude where they would no longer be regarded as British colonials in terms of the Cape of Good Hope Punishment Act and with prospects of access to the sea through the independent port of Delagoa Bay.

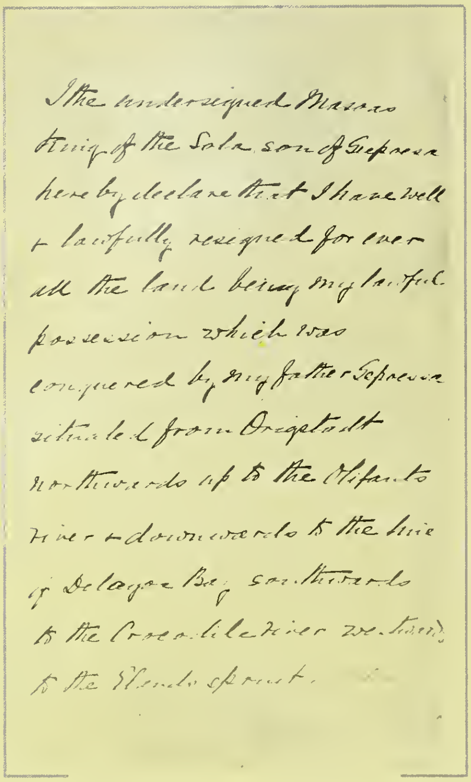
Accordingly he led an expedition to explore the north-eastern region as far as Lourenço Marques, where the Portuguese made friendly overtures towards potential neighbours and assured him of unhampered trade through their port. Here he also met J. A. Smellekamp, who promised him assistance in various ways, including trade with Holland.

On this journey, during which the Blyde and Treur Rivers were named, Potgieter traversed a sparsely inhabited, well-watered region with abundant wood. He evidently considered the collective advantages offered by this region to outweigh the dangers and tragic deaths such as those which had befallen the two preceding parties of Lang Hans van Rensburg and Louis Trichardt. Hence he moved to the promised land with more than a hundred followers to settle and establish the village of Ohrigstad in 1845.

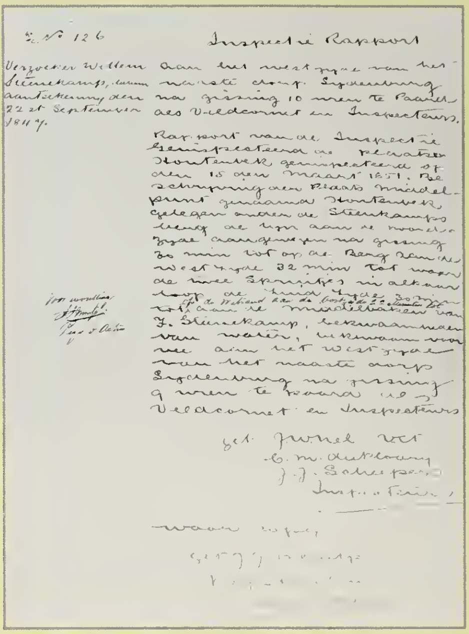
On his arrival there Potgieter learned from Mswati, the Swazi *Ngwenyama* (paramount chief), that he claimed to have inherited from his father Sobhuza I the sovereignty over the larger portion of what is today known as the Eastern Transvaal (including the Steenkampsberg). By virtue of a written agreement this land was exchanged for a hundred head of cattle in 1846.[1]

Ohrigstad had to be evacuated and abandoned in 1847 due to a malaria epidemic, the inhabitants settling freely southwards.

By this year some 300 farms had already been allocated. It was customary in those days for related families to settle near one another. One of several examples is that of the Minnaar family. On 4 August 1845 six members were allocated adjoining farms all along the Waterval River.[2] A similar togetherness also applied to the Steenkamp family. Although documentation in this case is rather incomplete and circumstantial, it does indicate that four closely related Steenkamps were allocated the adjoining farms Houtenbek, Onverwacht, Verloren Vallei, Klipbankspruit, Kliprivier and Draaikraal between 1847 and 1851.[3] The logical and



I the undersigned Masoas King of the Sola son of Sepresa hereby declare that I have well & lawfully resigned for ever all the land being my lawful possession which was conquered by my father Sepresa situated from Origstadt northwards up to the Olifants river & downwards to the line of Delagoa Bay southwards to the Crocodile river westwards to the Elands spruit.



No 126 Inspectie Rapport

Verzoeker Willem Steenkamp, [illegible] aanteekening den 22 st September 1847.

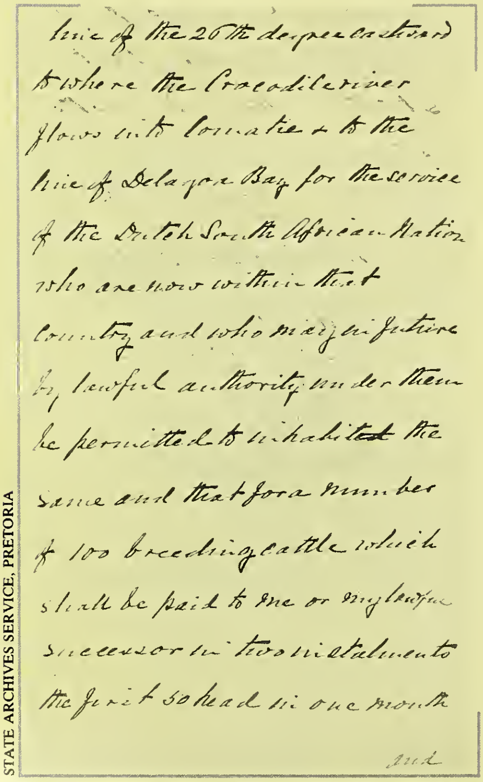
aan het west zyde van het naaste dorp. Sydenburg na gissing 10 uren te Paard als Veldcornet en Inspecteurs.

Rapport van de Inspectie Geinspecteerd de plaatse Houtenbek geinspecteerd op den 15 den Maart 1851. Beschryving der Plaats middelpunt genaamd Houtenbek, gelegen onder de Steenkampsberg de lyn aan de noorder zyde aangewezen na gissing 30 min tot op de Berg aan de west zyde 32 min tot waar de twee Spruitjes in elkaar loop de [illegible] zyde 30 min tot aan de middelbaken van F. Steenkamp, bekwaam van water, [illegible] aan het West zyde van het naaste dorp Sydenburg na gissing 9 uren te paard als Veldcornet en Inspecteurs

get. J. W. [illegible]
G. M. [illegible]
J. J. Scheepers
Inspecteurs

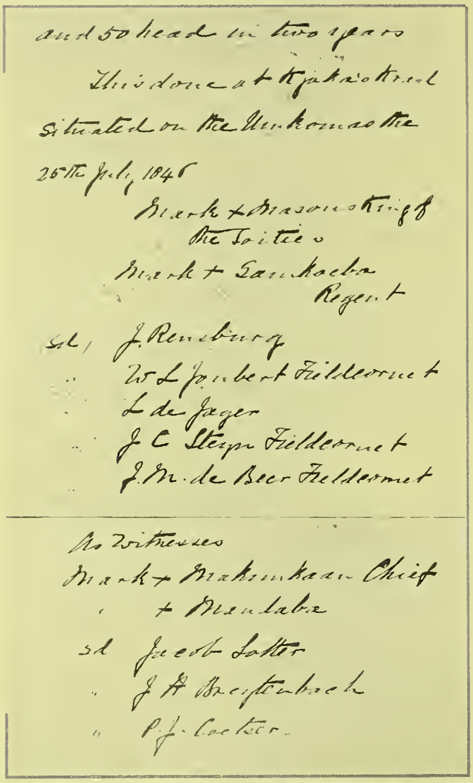
M. J. O'GRADY COLLECTION

Copy of the original survey report of the farm Houtenbek, dated 15 March 1851. In those days farm boundaries were determined by a field-cornet and two inspectors, the distances being expressed as time on horseback. Note the reference to the Steenkampsberg and F. Steenkamp.



line of the 26th degree eastward to where the Crocodile river flows into Comatie & to the line of Delagoa Bay for the service of the Dutch South African Nation who are now within that country and who may in future by lawful authority under them be permitted to ~~inhabitat~~ inhabit the same and that for a number of 100 breeding cattle which shall be paid to me or my lawful successor in two instalments the first 50 head in one month

and



and 50 head in two years

Thus done at Kjakao's kraal situated on the Umkomaas the 25th July 1846

Mark + Masonus King of the Soitee
Mark + Sankoeba Regent

sd/ J. Rensburg
" W L Joubert Fieldcornet
" L de Jager
" J C Steyn Fieldcornet
" J. M. de Beer Fieldcornet

As witnesses
Mark + Makunkaan Chief
" + Menlaba
sd Jacob Lotter
" J H Breytenbach
" P. J. Coetzer

STATE ARCHIVES SERVICE, PRETORIA

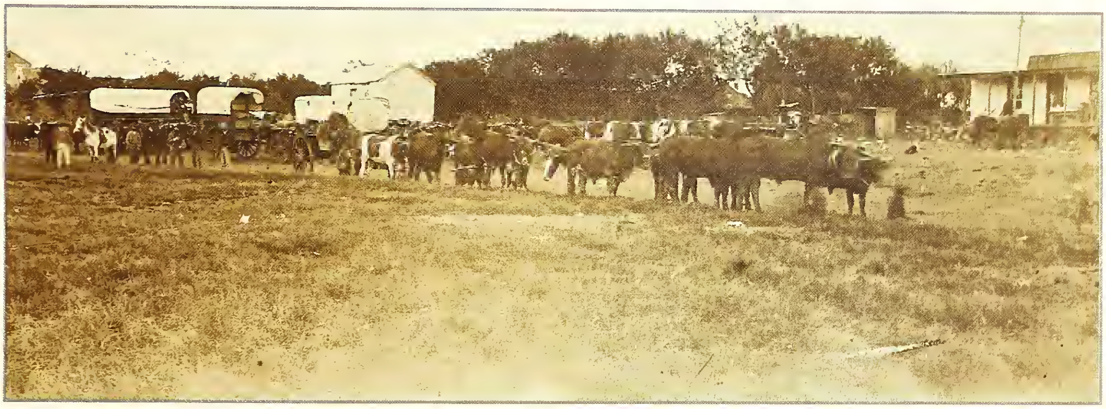
Text of exchange agreement between the Voortrekker leaders and Masoas (Mswati) dated July 25, 1846. Of the three documents in existence, this English version is the most legible. The reference to Masoas as "King of the Sola" (Zulu) on the second line is patently an error of the scribe.

STATE ARCHIVES SERVICE, PRETORIA

J. H. JANSON

WOLTERUS DULL

P. J. S. JANSON COLLECTION



Dullstroom in the early days. The photo was taken around 1895.

generally accepted inference is that the Berg is named after the Steenkamp family.

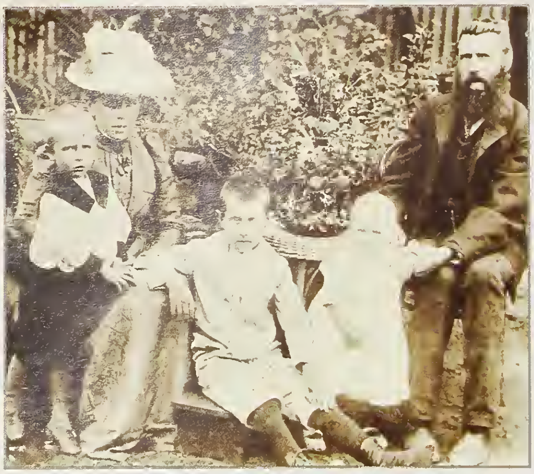
In the annals of the Zuid-Afrikaansche Republiek the first mention of the name *Steenkampsberg*, for some years a ward of the Lydenburg district, was made in 1855. The occasion was a meeting of the Commissieraad at the residence of Willem Steenkamp on 27 November 1855.[4] The name must then have been in general use for the Berg, which does not apply to a single mountain range but to an elevated, plateau-like region without clearly demarcated boundaries.

The original roads to localities suitable for farming in this virgin land followed the contours as far as possible to avoid natural obstacles. Access to the plateau entailed some road making along the natural depressions in hills and mountain sides. Korfnek was one of the early passes connecting the low-lying western regions with the later Dullstroom. Here it is joined by the road from Nazareth (Middelburg) via Lunsklip to Lydenburg, for many years the seat of the governing landdrost. From here the road was extended to the then Lourenço Marques in 1874 with a connection to the Pilgrim's Rest goldfields. Another early branch crossed the Berg from Goedehoop to farms around Roossenekal to the west.

THE FOUNDING OF DULLSTROOM

The village of Dullstroom may be considered the hub of the Berg. Events leading to its founding go back more than a century to the First Anglo-Boer War (1880–1881). During that time a committee under the chairmanship of Wolterus Dull collected money in Holland aimed at supporting those Afrikaans-speaking people who had suffered losses during the war.

However, the collected funds were eventually directed towards promoting the settling of Dutch people in the Transvaal, for which purpose the farms Groot Zuikerboschkop and Elandslaagte were bought in 1882.[5] In September of the following year J. H. Janson left Holland with the first batch of immigrants and after a long and tiring journey by ship, train and ox-wagon they settled on the two farms in May 1884.[5] The initial reaction on seeing their new homeland must have been one of shock and disbelief. Writing in *De Volkstem* c. June 1889[6] F. H. van Achterbergh, one of the immigrants, describes Groot Zuikerboschkop as "one huge mass of rock, shrouded in eternal mist, ravaged by everlasting cold, without any natural beauty." In spite of hardship they persevered and soon made a new life. In 1887 the settlement



P. J. S. JANSON COLLECTION

T. N. H. Janson and family in 1895. J. H. H. Janson is in the front centre.

STATE ARCHIVES SERVICE, PRETORIA

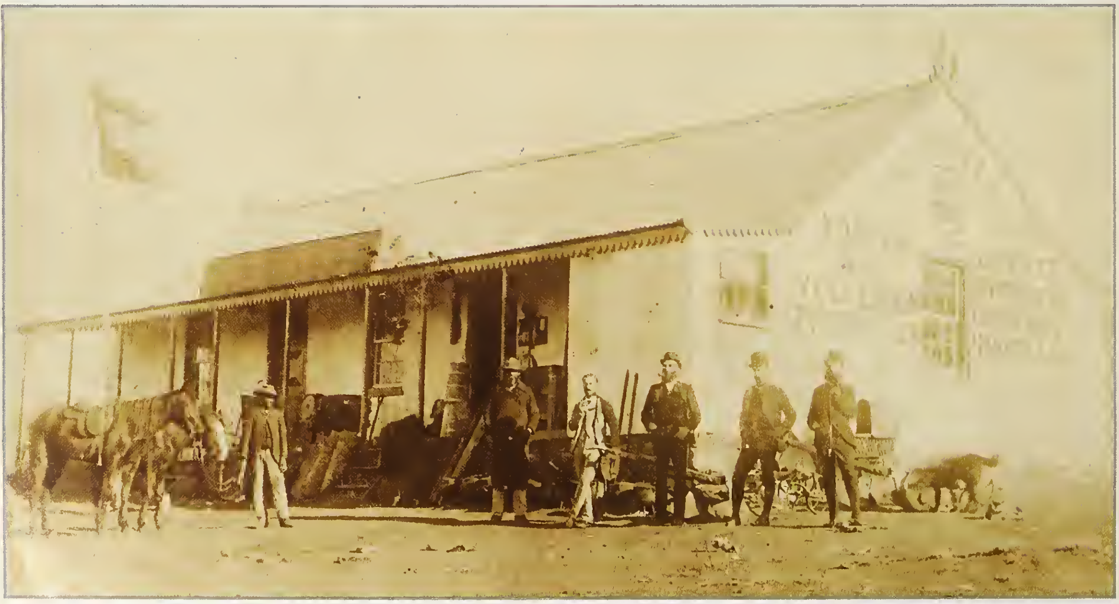
Long Tom canon during the siege of Mafeking. It was later used on the Steenkampsberg.

consisted of 48 white inhabitants, 8 houses, 3 stables and 10 cattle kraals. There was a shop of the Boeren Handelsvereeniging, and later an inn and a mill were built. A school was built at Vlettershof and the teacher, Anthony de Vletter, was also the first postmaster. J. H. Janson was appointed resident justice of the peace. The cornerstone of the church was laid on 9 January 1892.

In the meanwhile the community had applied to the Government for permission to establish a township to be named *Dullstroom* in honour of Wolterus Dull on a portion of Groot Zuikerboschkop. On January 1892 the town was proclaimed,[7] and in 1894 had a population of 100 whites.

During the Second Anglo-Boer war Dullstroom was practically razed to the ground and many of the inhabitants returned to Holland. Mr T. N. H. Janson was one of the first to return after the war and slowly the little village again rose from the ashes. As one of the pillars of the community during these difficult years, he acted among others as justice of the peace, sick-comforter and postmaster. As the latter he often walked all the way to Belfast to collect the post and returned the same day, a distance of 76 km.[8]

In later years his son J. H. H. Janson, then member of the Transvaal Provincial Council, lived opposite the Lydenburg-Belfast railway line, some distance from Dullstroom station. The story is told of occasions after a visit to Lydenburg when Mr Janson would arrange with the engine driver, Johnnie Duggan, to slow down the train sufficiently for him to alight opposite his farm, thereby saving him the discomfort of having to walk back in the dark from the station, especially on those bitterly cold winter nights![8]



S. P. ENGELBRECHT MUSEUM, PRETORIA

The shop of the Boeren Handelsvereeniging in Dullstroom in 1895. W. C. Janson was the proprietor.

THE SECOND ANGLO-BOER WAR

After the pitched battle of Dalmanutha (21–27 August 1900) the Anglo-Boer War increasingly assumed the form of guerilla warfare. During this period the Berg experienced sporadic fighting. There was firstly a rear-guard action by a commando retreating from British forces with three heavy 155 mm Creusot guns, nicknamed Long Toms. An assembly point of these guns is recalled by the *Long Tom* railway siding, clearly visible from the road between Dullstroom and Belfast.

A sharp encounter took place in December 1901 at Elandspruit, better known locally as Ouhoutbossie. In all there were 37 British casualties and 25 on the Boer side. Next to the main road between Lydenburg and Dullstroom is a prominent memorial in honour of the fallen British and another, some distance away, in memory of the fallen burghers.

An unfortunate incident took place on 25 January 1902 when Assistant Commandant-General Ben Viljoen, travelling from Oshoek to Pilgrim's Rest, was captured in an ambush west of Lydenburg. In the skirmish two of his adjutants, Jacobus Nel and L. Jordaan, were killed, while the General was struck in the chest by a bullet. Miraculously the bullet was stopped by his notebook and while a prisoner of war on St. Helena he wrote a book which was translated into English under the title "My Reminiscences of the Anglo-Boer War."

STATE ARCHIVES SERVICE, PRETORIA

General Ben Viljoen

GEOLOGY AND PHYSIOGRAPHY

In its widest connotation the name *Steenkampsberg* applies to an elevated plateau-like region, roughly 20 km wide and extending some 40 km north of Dullstroom, but physiographically even southwards towards Belfast.

The region is situated approximately 2 000 m above sea-level, culminating in *Die Berg*, the highest point in the Transvaal at 2 331 m. Also, the highest point on the South African Railway System is reached near Nederhorst Siding, 7 km north of Dullstroom, at an elevation of 2 097 m.

The physiography of the Berg is largely determined by its geological composition and structure. It is composed of hard, resistant quartzite layers alternating with bands of shale, some of which are partly metamorphosed to hornfels and with an intrusion of the whole succession by thick diabase sheets.

The relatively low dip of the strata to the west has promoted the development of a fairly level landscape which is practically nearly free from erosion in its central parts. Hence the Berg, with an average annual rainfall of some 800 mm, constitutes the watershed of streams draining to the east and west. It also lends itself to the formation of perennial pans and marshes and is an important mountain catchment area.

The soil types encountered on the Berg reflect the aforementioned conditions with variations in the geological substructure. Dark-coloured loams form by weathering of the diabase sheets, whereas disintegration of the quartzites gives rise to light-coloured, sandy soils. Loose sand grains contribute selectively towards the other soil types by being distributed over a wider area by wind and surface water.

No mineral deposits are known from the Berg, in contrast with neighbouring regions which have rich deposits of coal and ores of chromium, vanadium, platinum and gold. Is the Berg perhaps destined to compensate for its lack of minerals by becoming a model of nature conservation?

INDIGENOUS LIFE

Within a year of the establishment of Ohrigstad, the pioneers enacted legislation to regulate hunting.[9] Non-residents were forbidden to hunt and it was an offence for anyone to assist an illegal hunter. Residents were not allowed a bag bigger than needed for household use. Heavy penalties were prescribed for contraventions.

By 1858 the extent of game extermination was causing grave concern. This applied especially to elephant, as ivory was a highly valued commodity for trade and export. In this year a new law made extensive provisions for stricter control of hunting.[10] Besides elephant, white rhino, hippo, giraffe, bushpig and warthog, the schedule contained the names of no fewer than 17 species of antelope. It is interesting to note that the sable antelope was mentioned also by its alternative name "Harris-bok."

Although no records could be traced of kudu ever having occurred on the Steenkampsberg proper, the 17th edition of *Rowland Ward's Records of Big Game* lists the head of a kudu from the Lydenburg district as the world record with horns measuring 71½ inches (181,6 cm). The bull in question is said to have been shot in Sekhukuneland, adjacent to the Steenkampsberg, in 1916.

Farm names such as Elandslaagte and Kwaggashoek testify to the former presence of eland and zebra on the Steenkampsberg. These, and a number of other species which have likewise disappeared, serve as a mute reminder of the urgent need for conservation of the Berg.

The drought-resistant yellow clingstone peach, although an alien, deserves a place in this narrative. The tree claims citizenship of its adopted land, having spread surprisingly quickly from established farmyards to cover valleys and hills adjoining the Berg. The fresh fruit could conveniently be carried by travellers, hunters and cattle herders for consumption in outlying areas. The seeds are known to germinate readily. Unharvested fruit was no doubt further distributed in other ways, such as by baboons and rodents. The rocky hills around Roossenekal, north-west of Dullstroom, provide striking testimony of how the trees invaded the countryside. In spring their presence is betrayed by a scene rich in pink blossoms. When a prospector, Alec Patterson, made the first discovery of gold near Pilgrim's Rest in 1873, he was surprised to find peach trees on this remote site, known to this day as *Peach Tree Mine.*

N. J. VAN WARMELO COLLECTION

Mampuru

STATE ARCHIVES SERVICE, PRETORIA

Sekhukhune

The unpretentious clingstone possesses advantages over other kinds of fruit by lending itself well to preservation in several ways. It is made into jam, canned, dried in the form of loose chunks, wrapped in thin sheets and in plaits wound into rolls resembling homemade tobacco rolls. The housewife could hardly make enough of the useful delicacies to last the winter months. No wonder the crop was at times harvested in ox-wagons!

Lastly, as the early records show, the clingstone peach was a favourite ingredient used in the distillation of peach brandy or *mampoer*, a certain Tant Grieta Steenkamp becoming widely known for the excellence of her special brand. This home-made distillate is fast disappearing today as the issue of new licences is limited by law. Mampoer is reputedly named after Mampuru, who instigated the murder of his half-brother, Chief Sekhukhune. This incident had wide repercussions around the Berg. It led to the Mapoch War, in which Field-Cornet Roos, the hero of Majuba, and Commandant Senekal, together with 23 other burghers, lost their lives. The town of Roossenekal is named after the two officers.

The siege of that fatal hill, Hoofstadkop, ended with the surrender of Mampuru, who was tried and executed in Pretoria in 1883. The cavernous surroundings of Hoofstadkop were proclaimed a National Monument in 1969 under the name *Mapoch's Caves.*

LAND USE

Climatic conditions on the Berg largely determine the type of farming, which primarily consists of cattle ranching and the raising of merino sheep. The wool clip is particularly valued for the fineness of its fibre and clean yield.

The breeding of horses became popular soon after it was establised that the Berg was free of the dreaded horse sickness. Prominent among the early breeders were Michael O'Grady, second owner of Houtenbek, and his two eldest sons Thomas Frederick and John. Irish by birth and temperament, it was a foregone conclusion on which side their loyalty lay at the outbreak of the Second Anglo-Boer war, and many an O'Grady horse served in a Boer commando.[11] Towards the end of the war redundant animals roamed about untamed, hence the description of "wild horses." Their descendants may even today be encountered in remote parts of the Drakensberg north-east of Lydenburg.

Trout farming and provisions for angling have in recent years become a commercial proposition of ever-increasing importance. The story begins in Lydenburg more than 60 years ago.[12] When Mr H. J. Gurr, the local postmaster, caught a trout of doubtful origin in the Dorps River in 1912, he conceived the idea that trout would thrive in streams in the district. Accordingly he ordered ova from Jonkershoek and later from the Pirie Hatchery at King Williams Town. He obtained a hatching box and made others himself. The ova which arrived packed in moss were placed in the boxes in the water-furrow below his house. He once lost nearly all the contents when the furrow came down in a sudden spate. One big consignment from Pirie rotted on the way.

STATE ARCHIVES SERVICE, PRETORIA

Field-Cornet Roos

M. J. O'GRADY COLLECTION

Michael O'Grady and family in 1895. Thomas Frederick is in front centre.

These setbacks did not deter him. He reared fingerlings which he liberated in local streams from about 1916 onwards. To assist him financially he sold some to interested parties in Sabie, Pilgrim's Rest and Swaziland.

When Mr Gurr left Lydenburg in 1920 the work was carried on enthusiastically by F. C. Braun, the local watchmaker and jeweller. A trial stocking of a stream on the farm Kraaibosch, on the edge of Steenkampsberg, proved successful. Here three anglers between them caught 72 trout in one day in 1922. The news proved to Braun that trout would thrive in these clear, cold mountain streams.

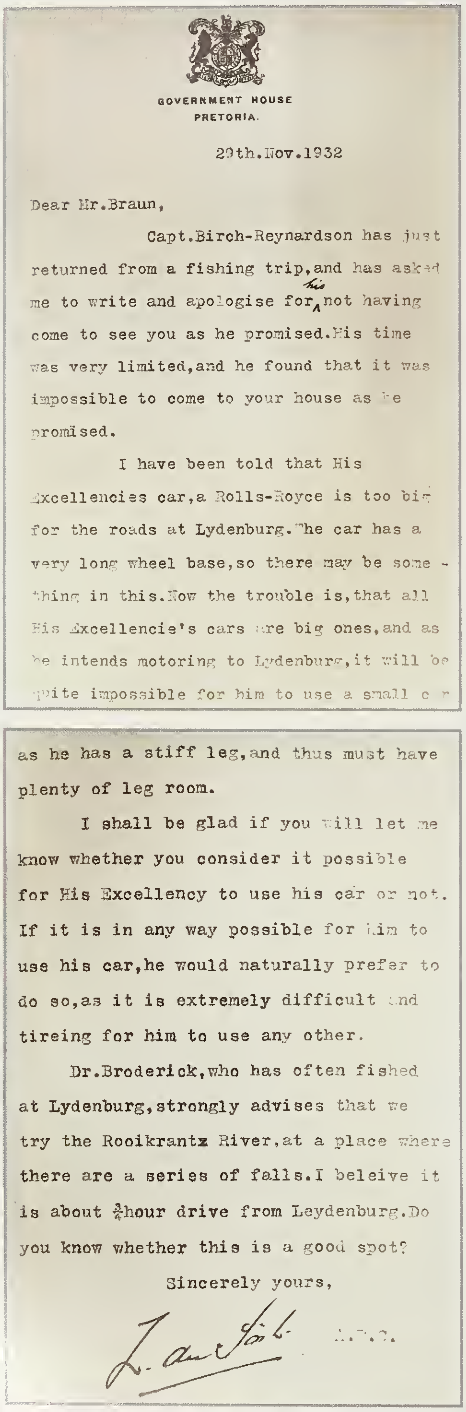
Two years later the Lydenburg Trout Protection and Angling Society was formed with Braun as secretary. Funds raised by subscription enabled him to carry on doggedly during the following 25 years, during which time he reared fry from about half a million ova and distributed them in local waters.

Many stories are told of him, such as often being seen over weekends carrying fish in a paraffin tin on his shoulders. Transport over longer distances sometimes proved to be a problem. Where a road existed the fish were transported by motor car, mule cart, or bicycle. Mostly walking was the only way. A friend, the then Inspector of Roads Mr J. F. Huggard, who was a keen angler, often assisted him in the distribution. On one occasion when Mr Huggard had to travel to Pretoria by train, Braun gave him a container full of small trout. Mr Huggard persuaded the engine driver (doubtless the amicable Johnnie Duggan) to stop the train at the Lunsklipspruit bridge so that he could discharge the contents of the container into the stream.

Official recognition came in 1948 when the Province founded the Fisheries Institute in Lydenburg to conduct research into various aspects of trout culture and to expand the good work of enterprising individuals to date. It also supplied applicants with trout and other fry as well as with eyed ova for many years.

Commercial trout breeding has largely been taken over by private enterprise and the Institute's work, apart from research, is now confined to supplying eyed ova to clubs and private owners and to the stocking of public streams with sizable fish.

Seen in retrospect, much may be learnt from the Berg's eventful history of occupation by man. Its attractive natural attributes should contribute towards its development into a distinctive niche in the Eastern Transvaal. ♥



GOVERNMENT HOUSE
PRETORIA.

29th.Nov.1932

Dear Mr.Braun,

Capt.Birch-Reynardson has just returned from a fishing trip,and has asked me to write and apologise for his not having come to see you as he promised.His time was very limited,and he found that it was impossible to come to your house as he promised.

I have been told that His Excellencies car,a Rolls-Royce is too big for the roads at Lydenburg.The car has a very long wheel base,so there may be some - thing in this.Now the trouble is,that all His Excellencie's cars are big ones,and as he intends motoring to Lydenburg,it will be quite impossible for him to use a small car as he has a stiff leg,and thus must have plenty of leg room.

I shall be glad if you will let me know whether you consider it possible for His Excellency to use his car or not. If it is in any way possible for him to use his car,he would naturally prefer to do so,as it is extremely difficult and tireing for him to use any other.

Dr.Broderick,who has often fished at Lydenburg,strongly advises that we try the Rooikrantz River,at a place where there are a series of falls.I beleive it is about ¾hour drive from Leydenburg.Do you know whether this is a good spot?

Sincerely yours,

L. du Toit A.D.C.

TRANSVAAL NATURE CONSERVATION DIVISION

TRANSVAAL NATURE CONSERVATION DIVISION

Frank Braun (left) with friend, transport and trout containers.

Left: The Berg and surroundings has long been a favourite trout angling area. Arrangements for a visit by the then Governor-general, the sixth Earl of Clarendon.

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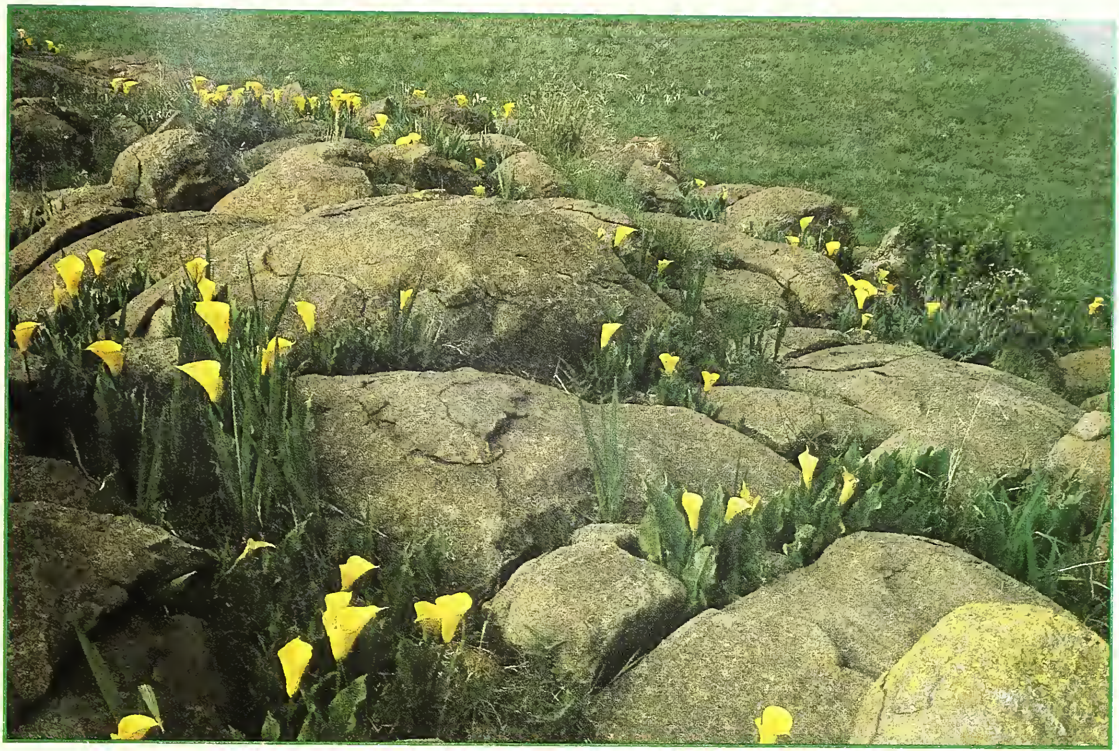

S. S. DU PLESSIS

Zantedeschia pentlandii among the rocks.

The Flowers of Dullstroom

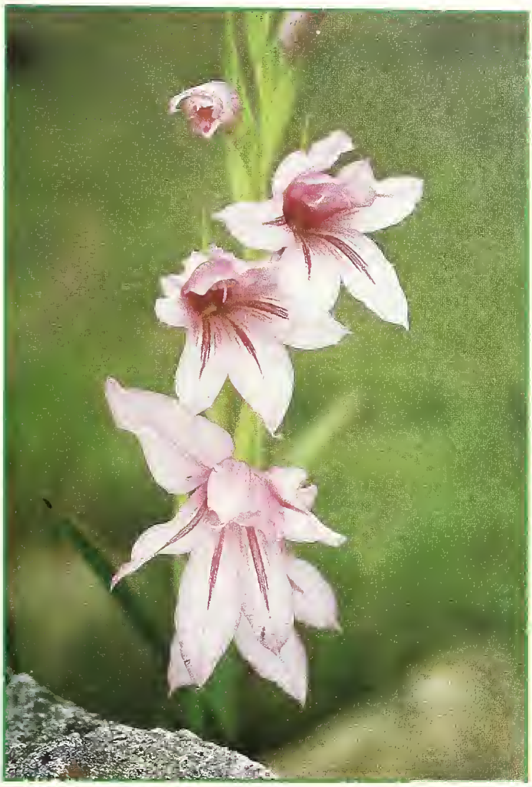
Hugh Cameron

THE upland village of Dullstroom, lying at an altitude of 2 070 m, and only two degrees south of the Tropic of Capricorn, enjoys a sub-alpine climate regarded by meteorologists as unique in the Republic of South Africa. This climate combined with an average annual rainfall of 820 mm, produces an abundant and varied number of flowering plants, a flora which is second to that of few other places in the Transvaal.

During the height of the flowering season as many as 120 different species of wild flowers grow quite naturally in the gardens of the village, whilst the many vacant stands have a garden of wild flowers which flourish under nature's care. Along the sides of the gravel roads grow gladioli, wahlenbergias, osteospermums and pelargoniums. In the countryside around the village outcrops of rock form natural rock gardens where two species of arum lilies, *Zantedeschia aethiopica* with a white flower and the smaller exquisite pink *Zantedeschia rehmanii*, are found. Alongside these lilies grow red hot pokers, watsonias, gladioli and littonias. Transvaal's floral emblem, the large beautiful golden arum lily *Zantedeschia pentlandii*, which is only known from this area of the Steenkampsberg, grows on the edges of neighbouring vleis. So highly prized were these lilies that in 1895 the sum of 90 guineas was refused for two plants. Some economist may care to calculate the equivalent sum in today's rand.

TRANSVAAL NATURE CONSERVATION DIVISION

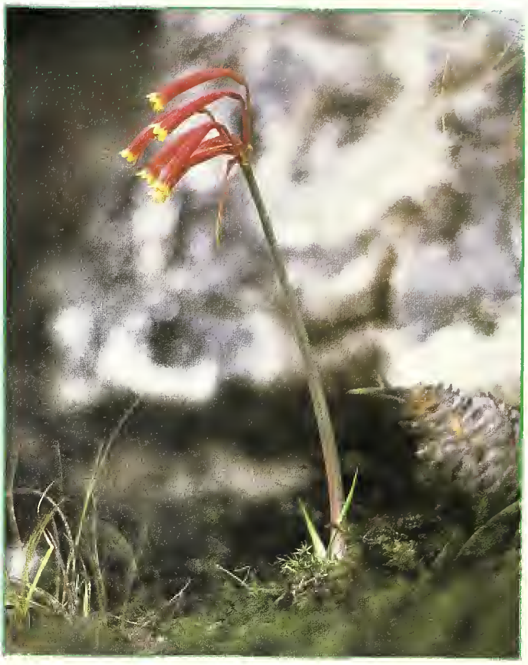
Although Dullstroom and the surrounding streams and dams are well-known to trout fishermen, the meadows, vleis and river banks have rarely been visited by botanists and wild flower enthusiasts. This leaves plenty of scope for the identification of the more conspicuous flowering plants, quite apart from the many less showy species which have little or no appeal for the layman but delight the hearts of botanists. During the past five summers a private botanical survey, undertaken in co-operation with the Transvaal Nature Conservation Division, yielded over 200 species of flowering plants, with a number still awaiting identification. The summer of 1980-81 was particularly rewarding as three species new to the area were found: a gladiolus still awaiting positive identification; *Cyrtanthus macowani*, an Eastern Province species never yet collected this far north and a new beautiful pink gladiolus which grows beside waterfalls and has hence been named *Gladiolus cataractarum*.


S. P. FOURIE

Above: *Gladiolus cataractarum*

Left: *Zantedeschia pentlandii* study.

The flowering season is heralded by the brilliant red fire lily *Cyrtanthus tuckii,* so distinctive in the veld recovering from the winter frosts. In wetter places the yellow tulp *Moraea huttonii* attracts attention with bright yellow flowers on stalks a metre tall. Then arrives the main flowering time in the months of December and January when the ground orchids appear. Some species such as *Satyrium longicauda* with its pink-edged white petals may be found in hundreds, whereas other orchids grow singly or in twos and threes. Most of these orchids do not flower every year and if the species is scarce a large number of sites must be visited before a flowering specimen is found.


FANIE VENTER

Cyrtanthus macowanii

The river red-hot poker *Kniphofia fluviatilis* flowers along the stream banks, whilst in amongst the rocky outcrops *Kniphofia rigidifolia* with its stiff swordlike leaves may be blooming. Both species were first found in the Dullstroom area and neither is very widespread.

The river lily *Schizostylis coccinea* is a familiar sight. The scarlet blossoms may be found in many places along the banks of the rivers and streams, overhanging any quiet stretch of water.

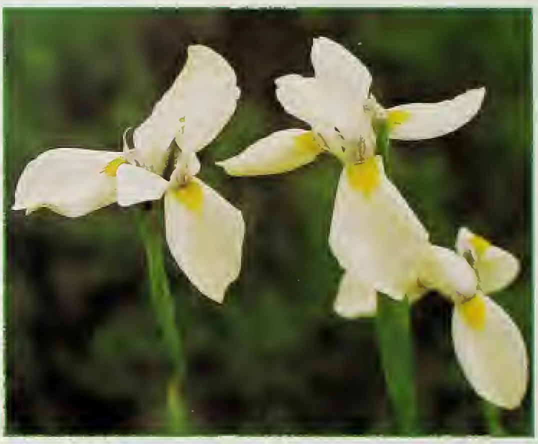
Growing in the grass, the wild convolvulus *Ipomoea crassipes* will be seen displaying the wonderful magenta colour of its very transient blooms whilst above the pale pink *Pelargonium luridum* flowers.

Many interesting aloes occur in the area. The type locality of *Aloe graciliflora* is among the sandstone hills in the vicinity of Dullstroom. The typical form, which is found among others at Nederhorst, is smaller and less robust than specimens from the Waterval Boven population, growing at a lower altitude. The orange flower heads of *Aloe boylei* stand tall above the grass and are visited by the large brown mountain beauty butterfly *Aeropetes tulbaghia*. How many people have smelt the scented *Aloe modesta*? It is the only fragrant aloe in South Africa and grows in the grasslands around Dullstroom.

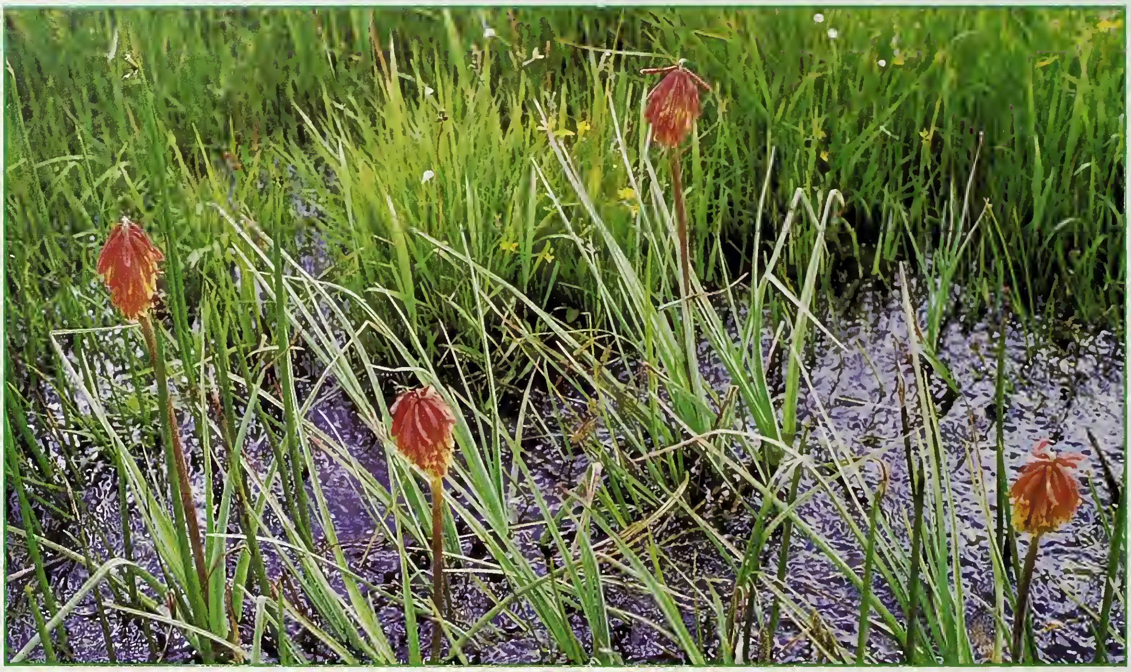
The tall pale yellow flower heads of the pineapple flower *Eucomis comosa* var. *pole-evansii* may be seen in the vleis, usually in clumps of six to ten plants, but in favoured places as many as 200 may be seen in bloom at the same time.

Under the rocks on the ridges flowers the spectacular *Streptocarpus dunnii*, with a striking brick-red flower spike glowing above a solitary leaf which sometimes measures half a metre in length.

The tall graceful pale pink crinum lily *Crinum macowanii* blooms in clumps in a few selected places, frequently in the gardens of the village. In contrast, *Protea parvula* creeps along the ground, its small pink and white flowers being easily overlooked.

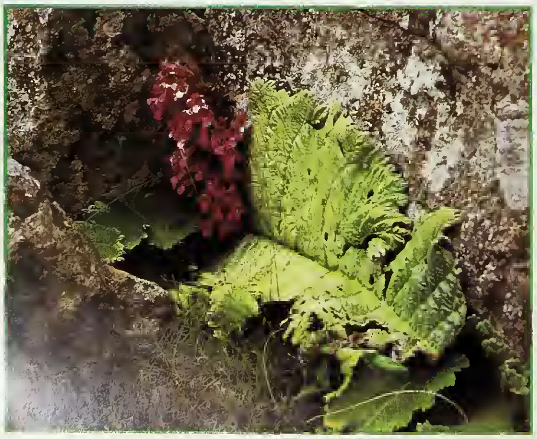

WARWICK TARBOTON

Moraea huttonii


WARWICK TARBOTON

Kniphofia fluviatilis

Perhaps the most spectacular plant in the Berg is the bright pink lily *Brunsvigia radulosa* with its huge head of flowers. The umbel can measure as much as 60 cm across and have more than 60 flowers on the head which is visible to the naked eye from half a kilometre away. The huge bulb grows in deep soil and is not found along the rocky ridges. The dried flower head eventually breaks off and the wind blows it along, scattering the seeds — hence the popular name of windball.


HUGH CAMERON

Streptocarpus dunnii

N. H. G. JACOBSEN

Schizostylis coccinea

Other plants which flower in profusion are the ground-hugging *Androcymbium melanthoides* forma *striatum*, more popularly known as the pyjama flower, and the tall graceful *Knowltonia transvaalensis* with its cream flowers. The Steenkampsberg form of *Crassula alba* bears deep crimson flowers, while the shy *Watsonia occulta* with its pale pink flowers is probably the least striking of this showy group of plants.

In autumn the last flowers appear. A fine example is the large pink *Nerine angustifolia*, so decorative and formerly more abundant than today. Unfortunately many of these plants grow within sight of the new main road where they are unlikely to survive the grabbing hands of passing tourists.

The high grasslands of the Steenkampsberg remain botanically unexplored, and due to the altitude will probably reveal unexpected treasures in due course. Another fruitful area will be along the escarpment edge where frequent mists are important in supplying moisture for small plants living in the crevices between the rocks.

Whether for a botanist, farmer, angler or photographer, the whole area offers a variety of stimulating pursuits. Conservation measures need to be timeously implemented if many of the beautiful and unique flowers in this area are still to be seen in the years to come.

VIERENTIA BEUKES

Berkheya sp.

Protea parvula

HUGH CAMERON

WARWICK TARBOTON

Birds of the Steenkampsberg

Warwick Tarboton

Longtailed widowbird

SHAPED like an inverted bathtub, the Steenkampsberg is a high-lying extension of the Transvaal Highveld. The birds of this region are thus essentially those found elsewhere in the eastern Highveld, although the altitude imposes climatic constraints both on the avifauna and on man's activities.

The climate, with very cold winters and summers that can be wet and misty for days on end, is a major factor influencing agricultural activity in the area. Extensive sheep grazing is the main form of land use and has left much of the landscape relatively unchanged. The plateau-like top of the Steenkampsberg is a mosaic of rolling grassland, rocky ridges, outcrops and hillsides, and vleis which become incised near the plateau edge where they coalesce to form the streams and rivers which are much favoured by trout fishermen. Superimposed on this uncomplicated landscape are the artefacts of man's settlement and activity: plantations of pines, innumerable large and small trout dams, a scattered quiltwork of cultivated fields, mainly for hay, beets and potatoes, and isolated homesteads surrounded by protective belts of gum or wattle trees.

The birdlife of the Steenkampsberg needs to be considered against this fabric of natural and man-made habitats. Firstly, the Steenkampsberg provides relatively large areas of near pristine habitat, and these support good populations of certain species, the numbers of which have become greatly reduced through loss of habitat elsewhere in the Highveld region. Secondly, because of its climatic uniqueness, there are a number of species here that do not occur elsewhere on the Highveld. Thirdly, there are the recent immigrants which have colonised the habitats introduced into the area by man — trout dams, plantations of alien trees, orchards, fields, homesteads and gardens. Even the telephone lines along the roads and fences have contributed to providing niches for some of the new colonists.

Overall the bird species diversity is not great, and it would be much less still if the recent colonists were not included. During three years of visiting the Berg to study cranes some 150 bird species have been recorded in the area. About a quarter of these are waterbirds. Probably most of them have always occurred on the natural vleis in the area but one or two species, such as the giant kingfisher *Ceryle maxima,* are more likely to have come along with the anglers to exploit the trout dams and trout-stocked streams. Other waterbirds include several heron species, several rails and crakes, and possibly the most charming of all, the whiskered tern *Chlidonias hybridus*. In summer they are to be seen flying about in their graceful, buoyant way at many of the grass pans and open-water vleis. They breed on the Steenkampsberg in small colonies and then disappear in winter.

The birds of the grasslands comprise the largest component of the avifauna, and make up about half of the Steenkampsberg list. This community can be subdivided according to seasonal status (a large proportion of the species are present only in summer), or according to their degree of endemism in the grassland region of South Africa (there are 10 such species here), or according to the sub-habitats occupied in the grassland. The latter approach is followed, but only those species of special interest because of their rarity or endemism are discussed here.

PETER JOHNSON

The jackal buzzard perches and breeds on rocky cliffs.

The first of the grassland sub-habitats are the areas of surface rock, ranging from isolated outcrops in the grassland to extensive rocky ridges and hillsides. These support some of the most characteristic birds of the area, the members of the chat family. The buffstreaked chat *Oenanthe bifasciata,* mountain chat *O. monticola,* and sentinel rock trush *Monticola explorator* are all endemic South African species, present throughout the year and are common and conspicuous. The endemic ground woodpecker *Geocolaptes olivaceus* is present, but less common. It is best located by its shrill call.

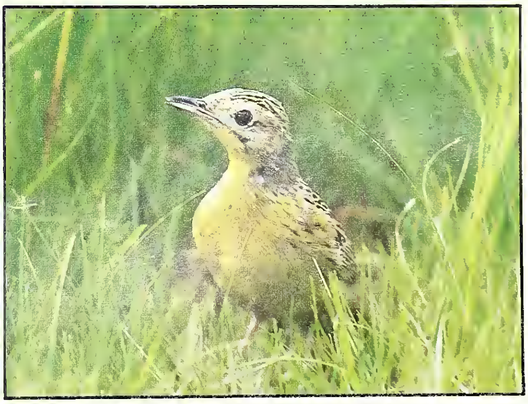
Among birds of prey the jackal buzzard *Buteo rufofuscus* is the commonest, using the rocky areas both for perching and breeding. A second most interesting and little known raptor, the Cape eagle-owl *Bubo capensis*, occurs in the Berg and roosts in the rocky outcrops by day. It is not an easy bird to detect, except at night when its sharp hooting notes serve both to betray the bird's presence and to distinguish it from the much more common spotted eagle-owl *Bubo africanus*.

Open grasslands are inhabited by a variety of larks, pipits, cisticolas, finches, bustards, cranes and an unique endemic ibis. The cranes are discussed elsewhere. The bald ibis *Geronticus calvus*, a dark blue-black bird with a conspicuous bald red top to its white head, occurs fairly widely in the wetter eastern Highveld. It is well represented in the Steenkampsberg, using the grasslands of the plateau for feeding and the cliffs fringing the plateau for breeding purposes.

It is curious that the rufous-naped lark *Mirafra africana*, one of the most common and widespread lark species in the Transvaal Highveld, is absent from the Steenkampsberg. Instead the longbilled lark *Mirafra curvirostris* is the common lark of the area, followed by the redcapped lark *Calandrella cinerea.* However, Rudd's lark *Mirafra ruddi* is the special member of this family to be found here. It is another South African endemic with a very restricted range. Very little is known about this bird. The Steenkampsberg is the northernmost part of its recorded distribution and it occurs on many of the grassy hillsides.

The common cisticola of the Highveld, the cloud cisticola *Cisticola tetryx,* is surprisingly also absent from the Steenkampsberg. Instead its sibling, Ayres' cisticola *Cisticola ayresii*, fills the summer days with its squeaky song as it cruises about high in the air. But the palecrowned cisticola *Cisticola brunnescens* is certainly the most interesting member of this family found here, frequenting the flat, marshy sponges on the plateau. It is appropriately called the "silent cisticola" by some authorities and one has to know its subdued insect-like call in order to locate the bird. It is fairly common.

Of the pipits, Richard's pipit *Anthus novaseelandiae* is the most common and the yellowbreasted pipit *Anthus chloris* the most interesting. The latter is another South African endemic, at the northern most limit of its range on the Steenkampsberg, and is a bird one would rather expect in the high Drakensberg of Natal. Despite its brilliant yellow breast in the breeding season, it is not a conspicuous bird, and usually flies off when approached, settling with its back facing one. A yellowbreasted pipit can usually be located by its rapid chipping



WARWICK TARBOTON

Yellowbreasted pipit

call which is reminiscent of the call of the male longtailed widowbird during display flight.

The extraordinary sight of the male longtailed widowbird *Euplectes progne* is one of the most characteristic cameos of the Highveld. In display flight the tail is splayed out and with slow, jerking wingbeats it flaps across its chosen patch of grassland. Males apparently play no role in the breeding cycle apart from attracting and mating with females, and devote much of their time to this activity. Females visit males only to mate, then lay, hatch and rear their offspring alone, often far from the male's display ground. This unusual mating system, known as polygyny, raises many interesting biological questions as to how and why it evolved. By day the males maintain strong rivalry, excluding others from their beats, whereas in the evenings they gather together to roost communally in reedbeds.

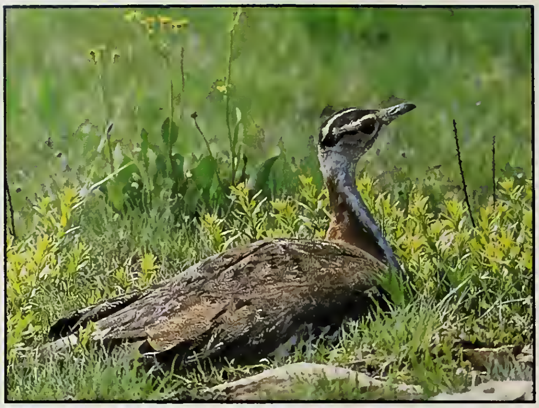
WARWICK TARBOTON

Buffstreaked chat

Some bustard species have unusual mating systems similar to those of the widowbirds, and the Steenkampsberg provides the arena for one of the most spectacular of these — the Stanley bustard *Neotis denhami*. It is a large bird, standing up to a metre high and weighing up to 15 kg. It has disappeared from much of the Highveld region through persecution and habitat degradation, but a good population still exists in the Steenkampsberg, thanks to the lack of human population pressure. In summer the mature males are to be found spaced out at intervals of perhaps 0,5 km to 2 km on prominent hillsides where they perform their remarkable "puffing" displays, raising their elongated breast feathers and bending back their necks. They occupy these solitary display sites throughout the summer and presumably use them to attract females to mate. The males play no role in the nesting cycle, and females after mating, go off to hatch their eggs and rear their young unaided. At the end of summer the bustards congregate in small groups and disappear from the Berg for the duration of the winter.

WARWICK TARBOTON

Whiskered tern


WARWICK TARBOTON

The Stanley bustard is a summer visitor.

GARTH BATCHELOR

Sentinel rock thrush

This sketch has touched on only some of the more interesting birds of the Steenkampsberg. It has not mentioned all the endemics, nor the many newcomers which frequent the plantations and gardens, such as sparrowhawks, doves, robins, cuckoos, flycatchers and white-eyes which are now firmly entrenched elements of the avifauna. But the *pièce de résistance* of the Steenkampsberg avifauna are the birds of the grasslands and sponges. The relatively unspoilt nature of the region has left these populations intact, making this part of the country the Highveld's ornithological jewel. ◆

PETER JOHNSON

Cranes on the Berg

Warwick Tarboton

ONE of the most evocative sounds of the mist-swept Steenkampsberg is the bugling call of the blue crane. This far-reaching sound heralds spring on the Berg: the birds are especially noisy at this time with the approach of the breeding season, and there is much jostling and competing as flocks break up into pairs and pairs set up their nesting territories in the more remote valleys. In the early morning the vibrant "unison-call", like a fanfare of trumpets and made by the pair in duet, can be heard, and one can see them performing their nuptial display dance. The blue crane's year seems so crowded and its life so bustling: scarcely have the winter flocks arrived than pairs start nesting, and no sooner are their young capable of flight than they are on the move, joining up with neighbouring crane groups, moving further afield, coalescing into larger flocks, ranging further, then eventually leaving the Berg for lower altitudes in winter.

Most South Africans will probably be familiar with the blue crane even if they have never seen the bird in the wild, for it is our national bird and features on one of our stamps and on our 5c piece. South Africans may, however, be less aware of our other two crane species, the crowned crane and the wattled crane. The presence of these three species makes this country unique. Nowhere else in the world do three crane species occur and nest side by side as they do here. Regrettably, even in South Africa there are few places apart from the Steenkampsberg where breeding populations of all three species still occur together. Our largest and most impressive crane, the wattled crane, has disappeared from much of its former breeding range. Today it is very rare and restricted in its distribution. By contrast, the blue crane is common in the grassland regions of the country and appears to have adapted best to the changing landscape.

WARWICK TARBOTON

Wattled cranes and blue cranes are peaceful neighbours. Above: Crowned crane group.

While the crowned crane is much scarcer than the blue crane it has not shared the fate of the wattled crane. The blue crane is endemic to South Africa and Namibia, whereas the crowned and wattled crane occur fairly widely elsewhere on the continent.

The three species provide us with an interesting cross-section of the crane family, a group which numbers 15 species and is found in Africa, North America, Eurasia and Australia. The crowned crane has the distinction of being the most primitive of the crane species, the crane "prototype." It does not bugle as other cranes do, but booms a two-syllabled note, giving rise to the Afrikaans name "mahem." The deep sound is achieved by resonation in a gular sack below its bill. The crowned crane has several anatomical and behavioural characteristics which taxonomists consider to be "primitive" or ancestral in cranes. It lays white unmarked eggs, for example, and it is the only crane to perch in trees, and even, on one recorded occasion, to nest there. One of the oddest sights I have seen in the Steenkampsberg was 50 crowned cranes roosting at night on top of an electricity pylon. No other crane would do that!

WARWICK TARBOTON

The wattled crane is a territorial bird, probably mating for life.

Crowned cranes are noisy birds, though not to the same extent as blue cranes. By contrast, wattled cranes are virtually silent. In three years I have only heard them call on the Steenkampsberg twice, making a sound somewhat similar to that of the blue crane.

The relative vociferousness of the three species may be linked to their different lifestyle. Blue and crowned cranes spend winter in groups or flocks which range far and wide to feed, then break up into pairs to breed, each pair establishing a territory to the exclusion of other cranes. In such a constantly changing social structure loud calls seem to have many obvious roles, from maintaining contact between individuals in a flock to the advertisement and defence of territories.

The Steenkampsberg wattled cranes behave differently. Pairs remain together on their territories year-round. They probably mate for life, and it is likely that a pair will occupy a chosen site for their lifetime. Their lifestyle lacks the hectic sociality of the other cranes, and for them the frequent calling associated with flocking, or jostling for mates and territories, is superfluous. Territorial advertisement is probably based mainly on visual cues. The white breast and neck make the bird very conspicuous, and a territorial pair would be visible to any passing wattled crane from a great distance. This conspicuousness may also be responsible for their present demise, as birds incubating on nests are often obvious. They are particularly shy birds, stealthily leaving the nest if approached, and will not return to incubate as long as the observer remains in view, even at distances of 400 m or more. Indirect human disturbance has thus made many potentially attractive breeding sites unsuitable for wattled cranes, and the Steenkampsberg provides these elegant birds with one of their few remaining retreats in South Africa.

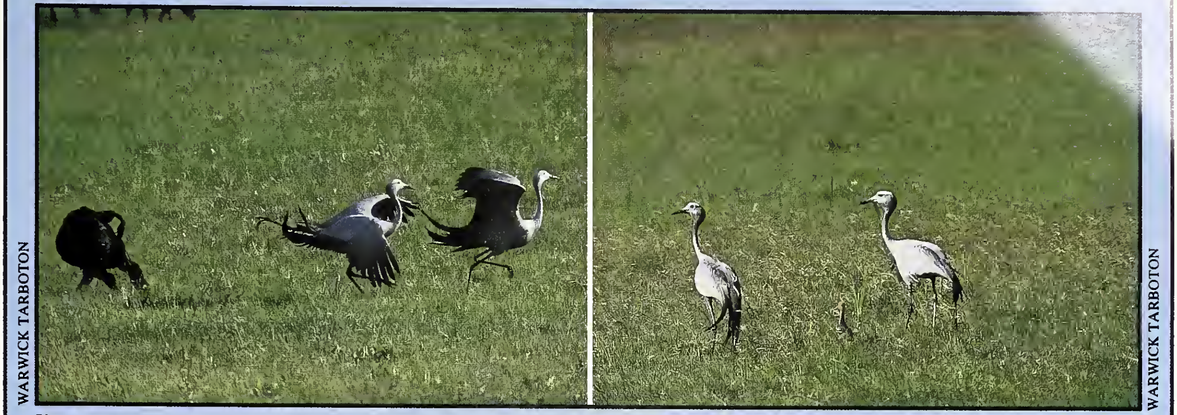
The breeding habits of the three species show some similarities and many differences. All breed on the ground, and all favour, in varying degrees, marshy sites. Wattled cranes invariably nest in vleis, and construct big heaped nests surrounded by moats of water with little effort at concealment. Crowned cranes also breed in vleis, but the nest, which is a large heap of material, is always screened by the tallest vegetation available and consequently it is the most difficult of the crane nests to find. Blue cranes go to the least trouble when nesting. On marshy ground they make a skimpy platform just sufficient to keep the eggs dry, but often nest away from water, even on bare rocky hillsides, when no attempt is made to construct a nest.

All crane species except the crowned crane lay cryptically coloured eggs, mostly pale brown covered with many smears and blotches of darker shades of brown. Blue and wattled cranes lay one or two eggs. Whereas the former often rear two young to maturity, the latter never do, as one of the chicks invariably dies or is perhaps killed by its sibling. The crowned crane's clutch usually numbers three and they regularly rear two, and on occasion three young.

In all cranes the male and female share parental duties, including incubation and caring for the

WARWICK TARBOTON

Crowned cranes are summer breeders.



Blue cranes are always up to something.

young. Blue and crowned cranes breed only in summer, the former starting to lay in September, the latter rather later, usually in December when suitable nesting cover has grown. Wattled cranes have no fixed breeding season. They nest at any time of the year, even in the coldest months when average temperatures on the Berg are near freezing. Individual pairs vary, but on average they lay eggs once every 14–15 months, this being the time needed for incubation and rearing a chick to independence. Their reproductive rate, averaging only 0,6 young per year, is much lower than that of the other two species.

Cranes eat a wide range of foods, from insects, small reptiles and frogs to grass seed, grain and the bulbs and corms of various plants. The wattled crane is the most aquatic of our species. In the Steenkampsberg they feed mostly in and on the fringes of the vleis, probing for food in the marshy ground with their long bills. Blue and crowned cranes often feed on dry land and at certain times of the year large flocks may become a nuisance to crop farmers. The critical time is a period of two to three weeks in spring when maize plants just emerging from the ground provide the flocks with an easily exploited food supply. Once the plants get beyond this stage they are no longer attractive to the birds, and if the flocks are prevented from coming onto the fields during the sensitive time (by using "big-bangs", scarecrows and other deterrents) they cease to be a problem, becoming instead highly beneficial allies to the farmers by controlling insects.

All three crane species are protected by legislation throughout South Africa, and may not be shot nor their eggs or chicks collected without a special permit. This provides the two more common species with sufficient protection, but a special conservation effort is necessary in the case of the wattled crane. Adequate breeding habitat has to be maintained if this species is not to be lost as a breeding bird in this country. The Steenkampsberg is the wattled crane's last stronghold in the Transvaal, and it is here that our conservation hope for the species lies.

The wattled crane's last stronghold in Transvaal is on the Steenkampsberg. It is here that our conservation hope for the species lies.

ANTHONY BANNISTER

Mammals

Garth Batchelor

THE Steenkampsberg today still provides a refuge for a number of interesting mammals. It is probably true to say that most of the smaller species present today are still representative of the past, whereas many of the larger species have long since disappeared from the scene. Only an occasional farm name, such as Elandslaagte and Hartbeesfontein, reminds us of an earlier, more abundant, age.

For a grassland environment the Steenkampsberg has a rich and varied mammal fauna, with 34 species having been recorded to date. In contrast with birds, few mammal species are readily seen. Most of the smaller mammals are, in fact, highly unobtrusive. Many are nocturnal or live in underground burrows and are thus seldom observed by the casual naturalist. There are, for instance, two species of golden mole and two species of molerat present on the plateau. Despite both being called "moles", golden moles are unrelated to molerats. They are totally insectivorous and almost blind, detecting their prey by an acute sense of smell and hearing. The Hottentot golden mole *Amblysomus hottentotus* occurs in the eastern and south-eastern parts of Transvaal at altitudes above 700 m and receiving a rainfall of more than 500 mm per year. It mostly constructs its burrows in sandy or sandy loam soils. It is confined to level grassland, sometimes near streams or marshes, sometimes a great distance from water. Like many other golden mole species it frequently surfaces while tunneling, making little mounds of soil. It will occasionally venture on the surface, especially after heavy rains, and is then easy prey for owls. In certain areas it co-exists with rodent moles.

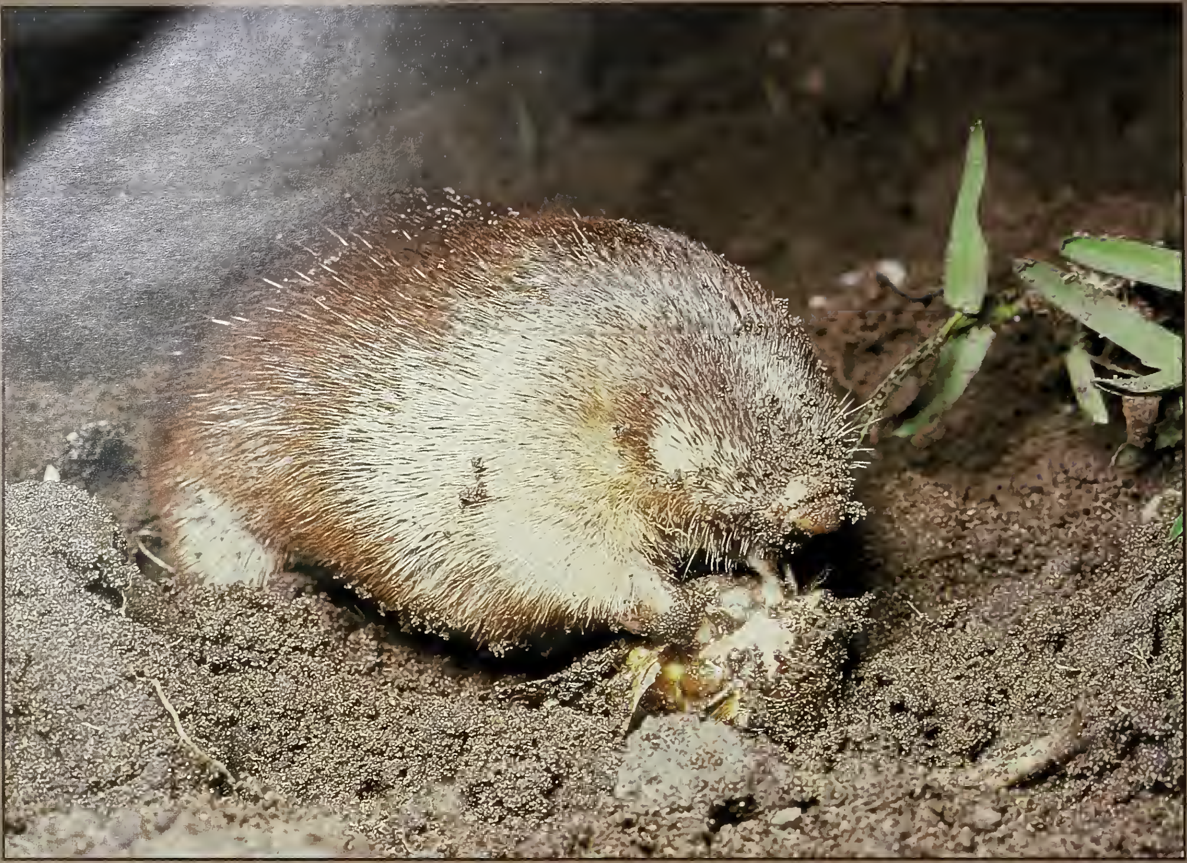
The rough-haired golden mole *Chrysospalax villosus,* on the other hand, has a very limited and localised distribution. It has only been collected at five localities in the Transvaal, and seems to be restricted to the central and south-eastern central parts. It appears to inhabit grasslands, especially the meadow-like ground on the edge of vleis and marshes. While being fossorial (living underground) like all other golden moles, it differs from them by leaving the tunnel entrances open, suggesting that it forages on the surface to some extent. It is very adept at finding the entrance, making a beeline for it when disturbed on the surface.

GARTH BATCHELOR

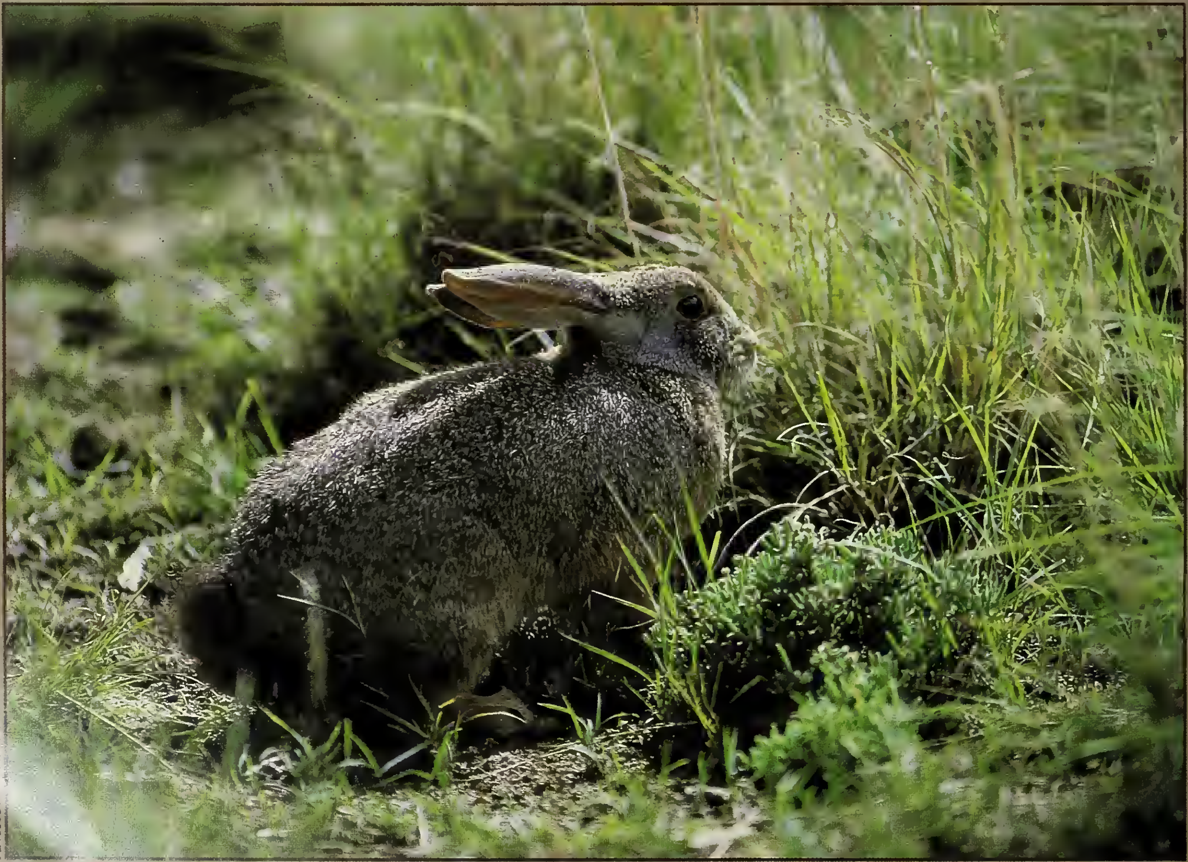
Above: The forest shrew is seldom seen.
Left: The Cape clawless otter is one of the most engaging denizens on the Berg.

PETER JOHNSON

Throughout its range the oribi is threatened by habitat degradation. The Steenkampsberg is one of its last strongholds.



ANTHONY BANNISTER



ANTHONY BANNISTER

Two rare and localised species from the Steenkampsberg. Above: Rough-haired golden mole. Below: Smith's red rock rabbit.

Molerats are rodents. They are far more closely related to mice and rats than to golden moles, whom they resemble more closely on account of their similar lifestyles. The common molerat *Cryptomys hottentotus* is a medium to high altitude species with a wide distribution in the Transvaal. It lives colonially in small family groups, in tunnel systems up to 300 m^2 in extent. The males are polygamous. A communal nest or sleeping chamber is lined with vegetable matter collected on the surface. In the rainy season the burrow system is extended to new feeding areas, leaving many fresh mounds of soil on the surface. They mostly feed underground on the stems of grasses, as well as on bulbs, roots and tubers. Sight and sense of smell are poorly developed and the food is located by touch. Excavating is done with the incisor teeth and the loosened soil is pushed up to the surface through side shafts. When heavy rains flood the burrows they are forced to the surface and become prey to owls.

The Cape molerat *Georychus capensis* has been recorded at only two localities in Transvaal, viz. at Ermelo and slightly north of Belfast. The logical inference would therefore be that it also occurs on the Steenkampsberg. It is more common in the south-western Cape Province, with populations along the coast to Transkei, and then in Nottingham Road in Natal. Very little is known about the biology of this species. In Transvaal it seems to favour loose or sandy soil on the edges of pans.

With the numerous marshes, vleis and seeps on the plateau it is perhaps not surprising that many of the species recorded have a direct or indirect affinity for water. It is certainly true of the shrew species. Of the eleven species of shrew present in Transvaal, only the forest shrew *Myosorex varius* and swamp musk shrew *Crocidura mariquensis* have been collected on the Berg. Both are closely associated with a moist microclimate and rank grassy vegetation adjacent to marshy ground on the plateau, and are particularly vulnerable to the veld fires so typical of the Berg in late winter.

The greater canerat *Thryonomys swinderianus* is another species of the vleis and streams. It can be found in many of the reed beds on the plateau but being crepuscular or nocturnal is not frequently seen. Their presence is always betrayed by distinct paths and runways in the rank waterside vegetation. The paths are often cluttered with small piles of cut grass stalks. Cane rats are excellent swimmers and are fond of frolicking in the water. The Cape eagle-owl and man are probably the most important predators of cane rats on the Berg. The meat, said to resemble a blend of chicken, veal and pork, is highly prized by the indigenous tribes throughout its range.

Another nocturnal occupant of the Berg's wetlands is the water mongoose, *Alilax paludinosus*. It is approximately 50 cm long excluding the tail and is robustly built with short legs and a uniform dark brown colour. It is often mistaken for an otter at a distance or under poor lighting conditions. Like the cane rat it prefers the rank vegetation along stream banks. It feeds primarily on crabs, but also takes frogs, fish, birds, eggs, small reptiles, rodents, insects and molluscs.

Both Southern African otter species occur on the Berg, where they are widely distributed over the plateau but never remain in any one locality for long. The Cape clawless otter *Aonyx capensis* is the larger of the two and appears to prefer shallower, slower-moving water and marshland in contrast with the smaller spotted-necked otter *Lutra maculicollis* which seems to prefer large open reaches of water and dams. The clawless otter is more diurnal and may occasionally be seen sunning on a rock or sandbank, given suitable weather. Both species feed extensively on crabs and frogs, with the spotted-necked otter showing a greater preference for fish than the clawless otter. Neither pose a threat to healthy trout in open water but may occasionally wreak havoc in the confines of a rearing or production dam. On balance, they are valuable species and contribute towards a balanced aquatic ecosystem on the plateau.

The drier grasslands and rocky outcrops likewise provide a habitat for a number of species, some with a very limited or localised distribution. Smith's red rock rabbit *Pronolagus rupestris*, for example, has been recorded from only three other localities in the province.

The three mongoose species occurring in the region are all strictly terrestrial and diurnal. These

JANET MATTHEWS

The suricate is diurnal and highly social.

include the colonial suricate *Suricata suricatta* and the solitary yellow mongoose *Cynictis penicillata* and slender mongoose *Galerella sanguinea.* Where the grass has been grazed down or burnt all three may frequently be seen searching avidly in the open veld or amongst the rocky outcrops for insects, reptiles, mice or active bird nests.

Another infrequently seen creature is the striped weasel *Poecilogale albinucha.* This rare animal has a wide but local distribution from Uganda to the Cape. It is strikingly marked in black and white stripes. A bushy white tail and a slender body help to distinguish it from the more common striped polecat *Ictonyx striatus.* The striped weasel is almost totally nocturnal in habits and has exceptionally poor eyesight. In fact it has difficulty in detecting prey more than 50 cm away! Rodents are the preferred prey and are readily retrieved down burrows. It has an interesting method of dispatching mice and rats. After seizing the prey by the throat, it rolls over and over, simultaneously kicking it with the back legs, which is thought to keep the prey off balance. There are reports that striped weasels may congregate at rodent irruptions, thereby playing a valuable role in the control of these agriculturally and economically harmful pests.

A number of smaller antelope species are still to be seen on the plateau. The common duiker *Sylvicapra grimmia* abounds in the plantations and thickets created by man. Steenbok *Raphicerus campestris,* oribi *Ourebia ourebi,* grey rhebuck *Pelea capreolus* and mountain reedbuck *Redunca fulvorufula* still occur in the remoter areas.

The oribi is both the most interesting and threatened antelope species on the Berg. In earlier times it was widely distributed over the grasslands of Southern Africa, from the Eastern Cape, Natal and the Orange Free State to Transvaal, Mozambique, Swaziland and Zimbabwe. In South Africa it is today confined to a few restricted areas in the four provinces and is classified as a Red Data species. One of the largest concentrations is found in the high eastern escarpment region of the Transvaal.

Two factors, namely habitat destructon and illegal hunting, probably mainly account for the decline of the Transvaal oribi populations. The eastern escarpment is a relatively high rainfall area and much of the species' last stronghold in the province has thus come under pressure from afforestation projects. Being a grassland species it only enters plantations as a last resort. Thus the loss of habitat to alien plantations places an question mark over its survival. In addition, the oribi is a confiding antelope and is consequently relatively easy to shoot. It has a peculiar habit of bounding off in a half circle away from an intruder, frequently stopping to look back over its shoulder and presenting an easy target. Illegal hunting with dogs also contributes to the decline. Although they are exceptionally fleet of foot and have been known to outpace even greyhounds in open country, fences are their downfall as they prefer to crawl under them rather than to clear them.

The sub-alpine vegetation and remoteness of the Steenkampsberg have resulted in this being one of the last strongholds of oribi in the Transvaal. Unfortunately, however, as two major roads have recently been constructed through the area this sensitive mountain plateau will be exposed to increasingly intense human pressure and disturbance and the future hangs in the balance. If this species, like the wattled crane, is to survive in the Steenkampsberg, stringent conservation measures will have to be applied. ◆

ANTHONY BANNISTER

Grey rhebuck study.

VIERENTIA BEUKES

The Lesser Creatures

Niels Jacobsen

AMONG the mountains and valleys of the Steenkampsberg lies an unique upland area covered in grass which clings to every curve, its smoothness only broken by ridges and outcrops of protruding rock. These provide the protection needed by many of the more sensitive plants and even a few trees such as the wild peach *Kiggelaria africana* and the tree fuchsia *Halleria lucida,* while the shrubby hard-leaved currant *Rhus dura* keeps low among the rocks. Herbs occur in profusion, in particular everlastings *Helichrysum* spp. with their shades of yellow and grey, while the mauve flowers of a tall herb *Mentha aquatica* form patches of colour against the grey rocky background. The wild brambles *Rubus ludwigii* and *R. rigidus* are also found here, the former particularly attractive with a white leaf undersurface contrasting with a dark green upper leaf surface.

There are swamps, seeps, streams and waterfalls in profusion in this enchanting place where the silence echoes in the mind. If you listen carefully the stillness is broken by a number of high-pitched voices drifting faintly on the air. This sound is the call of the striped stream frog *Rana fasciata* which even on cold winter nights sounds its tinkling song.

It would appear at first glance that there is little else living in this peaceful place. Should you however start to look, a new world suddenly opens up before your eyes. Among the seeps and swamps where the orange *Crocosmia paniculata* forms extensive stands live tiny frogs, only 10 mm in length. *Cacosternum nanum* is the name the scientists gave to these quaint denizens who must see the grasses as a forest of giant trees. They are commonly called lesser dainty frogs and represent one of the smallest amphibian species.

Here too one may find the longtoed kassina *Kassina wealii* among the wet grass tussocks while in the marshy soil in between grows an interesting plant *Lycopodium carolinianum*, a fern ally which is uncommon in Transvaal.

Exquisite to behold are two carnivorous bladderwort species *Urtricularia livida* and *U. prehensilis* with tiny leaves and large flowers of yellow or purple, while the sundew *Drosera burkeana* can be seen spreading its sticky leaves in hopeful anticipation. This is also the home of the three-striped grass frog *Ptychadena porosissima*, restricted to the moist upland areas of Natal and Transvaal. It may be seen crouching at the base of a grass tussock, its throat fluttering as it breathes. Numerous tadpoles and juveniles testify to a successful breeding season, but they have yet still to elude the pointed bills of the cranes and herons which are coursing the valleys in their endless quest for food.

The waters from these swampy areas ooze and trickle downhill, to collect and form silver streams which twist and wind across the valley floors. Sometimes these streams are evident, at other times not, as they appear and disappear under a dense growth of sedge and grass which forms a shading canopy over the water below. The streams are cold and clear and provide a home for two minnow species, the chubbyhead barb *Barbus anoplus* and the side-spot barb *B. neefi* which are more often than not only seen as flashes disappearing into the shelter of the overhanging vegetation.

As the stream tumbles over rocky barriers on the way to the plains below, the Zimbabwe mountain catfish *Amphilius uranoscops* may be seen darting under a rock where its drab coloration makes it one with the surroundings. Further downstream where the streams merge an introduced rainbow trout *Salmo gairdnerii* streaks swiftly off in pursuit of a passing minnow, which twisting and turning escapes into the dense vegetation at the water's edge.

WARWICK TARBOTON

Pseudocordylus subviridis transvaalensis

Sheltering in a burrow among the rocky outcrops on a ridge, a gnarled and warty toad awaits the fall of night. The gariep toad *Bufo gariepensis* shows an interesting and unique disjunct distribution. From the Cape Province which is its typical home, it extends to the top of the Natal Drakensberg and thence to the highland areas of Transvaal above 2 200 m. It only again occurs in the eastern highlands of Zimbabwe, at a similar altitude. This clearly shows the ancient migration routes of the Cape flora and fauna along the cooler mountain areas to the tropics beyond. With its green eyes and mottled dark olive green and olive brown colour, it adds a touch of life to the rocky places.

FANIE VENTER

Drosera burkeana

Higher up the slope the clicking stream frog *Rana grayi* may commonly be seen, including a variety with a broad orange or orange-brown stripe down the middle of the back. They are particularly numerous here and take shelter under tussocks of grass.

Also under the rocks, but only partially visible as they are buried in the soil, are a number of small round-looking objects. On closer inspection they turn out to be very alive and interesting amphibians indeed. The little male highveld rain frog *Breviceps adspersus pentheri* easily fits onto a 10c piece while the female is double that in size. It feeds almost solely on ants and termites. When disturbed it inflates itself so that it resembles a miniature football. It shows a remarkable independence of surface water and in fact can hardly swim, depositing its eggs in a chamber dug underground, usually under a rock. Here the eggs develop, coated with a gelatinous substance in which the tadpoles grow to emerge as miniature replicas of the adults. It is called the rain frog on account of the fact that it calls when the air is humid and overcast, preceding the arrival of rain. Perhaps it is this distinction that gives it such a supercilious air as it waddles along with nose held high.

N. H. G. JACOBSEN

Psammophis crucifer

N. H. G. JACOBSEN

Bufo gariepensis

A host of other animals, including two beautiful geckos, live in crevices between the rocks. The ocellated dwarf gecko *Lygodactylus ocellatus* is diurnal and is usually only seen as a shadow flitting into shelter. Should one however look carefully, this lizard may be seen basking and foraging on the boulders. The second species is nocturnal and is known to zoologists as *Pachydactylus capensis vansoni* — a clumsy name for such a beautiful animal which is also known as Van Son's thicktoed gecko. It is a particularly attractive gecko with a background colour of grey to brown and bars of black and white extending in blocks down the back and even onto the head and tail. Slow-moving, this gentle animal forages for insects among the rocks, its fat tail flicking should it encounter another of its species. The eggs are laid under a rock, usually two at a time, but the female often lays more than once at the same place.

An interesting lizard about 15 cm in length with hard spiky scales may be found in crevices in rocks just protruding above soil level. It lives in and forages from these crevices, feeding on grasshoppers and beetles, and is known as the Transvaal girdled lizard *Cordylus vittifer.* This upland form is particularly beautiful with a straw-coloured background on which flecks and blotches of red, black and yellow are superimposed. The heavy spiky scales of body and tail are used to anchor and protect the animal in its home should an attempt be made to remove it. It bears its young live, producing from two to three at a time.

One cannot help but notice the large and colourful Transvaal crag lizard *Pseudocordylus subviridis transvaalensis* adorning the summits of a rock, front feet braced and head held high while basking in the sun. The male is striking, having a black head, the black also extending down the back. The sides are a bright orange while the tail is mottled and flecked with orange. The chin and throat are also black while the chest and belly are off-white and washed ventro-laterally with orange. The female is considerably more drab, being mostly a dark greyish black with paler markings. The body is covered in granular scales while the tail retains its spikiness. The males pose to attract females, at the same time warding off intruding males. The vantage point is of great importance to the male and any transgressor is attacked and chased off without further ado.

Hidden in a crevice, one may find the occasional snake. The common eggeater *Dasypeltis scabra* aestivates during the day and ventures out at night in its quest for bird eggs. It is an unique snake, especially adapted to its feeding habits by having enlarged bony projections of the spine just behind the head. The egg is forced against these projections by muscular action and the shell is ripped open, crumpled and regurgitated. A valve prevents the contents from being ejected simultaneously.

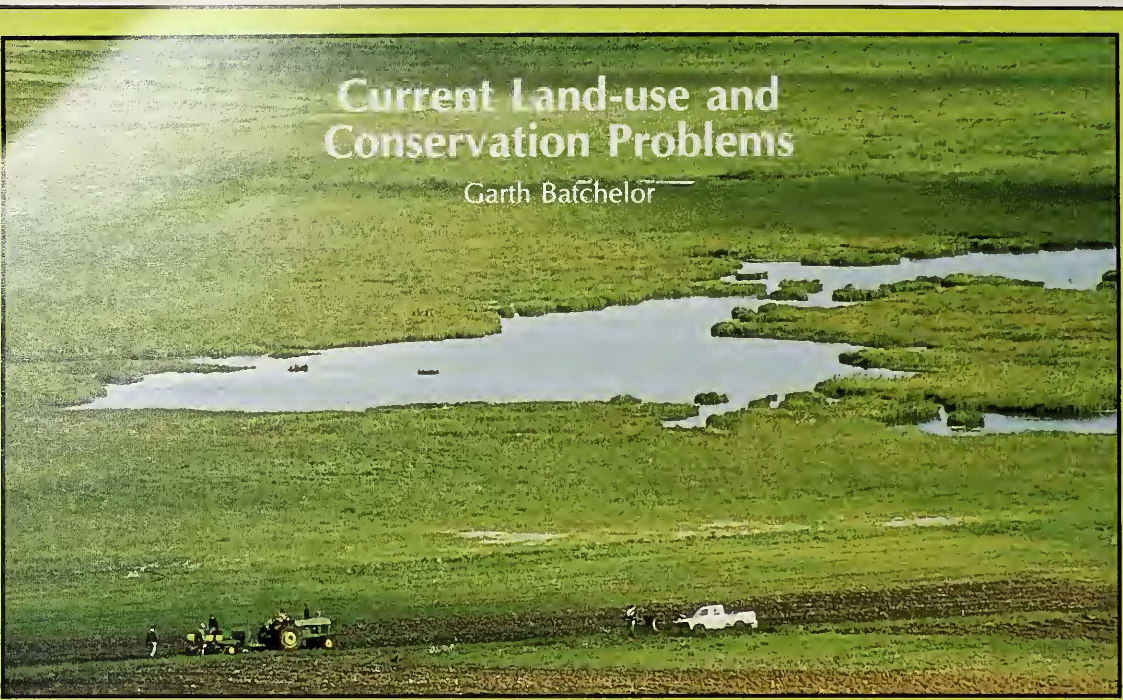
Among the grasses and sedges live the cross-marked sand snake *Psammophis crucifer* and the spotted skaapsteker *Psammophylax rhombeatus,* always on the lookout for frogs, lizards and mice. They are harmless creatures, darting off through the grass when disturbed, and only have enough venom to kill their small prey. In summer one may occasionally be fortunate enough to find their eggs under stones, usually six to eight clustered together. The female skaapsteker is usually found in the company of her eggs. She does not incubate, however.

The rinkhals *Hemachatus haemachatus* is found in the moister areas as well as among the rocks — black, short and thick, moving sluggishly to bask in the sun after its night's repast on frogs and toads or maybe even a mouse. Tread warily past him as he may spit at you in self-defence but if left unmolested he will entertain you for a while. It is such highlights that make this unique area even more memorable.

Now having glimpsed at the lives of the small fry of the Steenkampsberg, with the cool winds sweeping in across the mountain meadows, the mist cascading over the heights and rolling into the valleys and vleis, one becomes isolated in a world of one's own. One cannot help but wonder at the changing facade and yearn to see it again in the years to come. The scene is stark but peaceful, only in parts marred by the advance of progress in the shape of a road, telephone line or a pine tree. ◆

N. H. G. JACOBSEN

Crocosmia paniculata


WARWICK TARBOTON

Current Land-use and Conservation Problems

Garth Batchelor

SOUTH AFRICA is widely known as a land of great diversity and contrast. This is also true of its natural systems, which harbour a multitude of species, many of which are found nowhere else in the world. These ecosystems vary in degree of uniqueness and in size. While the ecological importance of small patches of forest or spectacular escarpment is easy to appreciate, others such as the grasslands are, because of the vast areas they cover, taken for granted and therefore often overlooked.

After some 150 years of agriculture, forestry, mining, urbanisation and industrial development, the natural grassland is today the most modified, degraded and threatened ecosystem in the country and only remnant patches of pristine habitat remain. The Steenkampsberg is one of these, a prime example of what the Highveld was before the coming of the first White settlers. Compared with most other areas on the Highveld, the Steenkampsberg consists of a wide range of habitat types and supports an exceptional diversity of grassland fauna and flora, a number of which are now classified as Red Data species.

In the light of the burgeoning human population and mounting pressure for more land it is not surprising to find some of the current land-use in the Steenkampsberg at loggerheads with the aims and principles of conservation. In this chapter we examine more closely some of the most important land-use practices in an attempt to see to what degree they may be compatible with conservation in its broadest sense. It must be stressed here that conservation does not merely involve the protection of a few individual species, but encompasses the maintenance of the efficient functioning of the ecosystem, all its components and its species diversity.

The following should not be seen as a criticism of the local community or anyone else. It should rather be viewed in the light of the introduction, keeping in mind that we are considering the last remnant of a complex and sensitive natural system. A holistic and multi-disciplinary approach is therefore essential.

The plateau is an area of high rainfall. The natural pasture is thus considered to be "sour", meaning that the grass in its mature state is unpalatable and undesirable. However, new growth after burning is so rapid that the area is considered to be excellent for sheep during the summer months. Trek sheep farming is thus the economic mainstay of the district, the sheep being taken off the plateau to lower-lying areas in the winter. The spring is heralded by plumes of smoke as extensive areas are burnt. As soon as the first green flush appears thousands of sheep reappear on the plateau, cropping the vegetation as long as the temperature and soil moisture content remain high enough to stimulate fresh growth. Often the same piece of land may be burnt twice or more in a year.

WARWICK TARBOTON

"Trek sheep farming is the economic mainstay of the district."

This practice of regular burning followed by heavy grazing and trampling is a cause of great concern to pasture scientists, not only on the Steenkampsberg but in the entire high rainfall region along the Transvaal escarpment. There is no doubt that the viability and quality of the grassland deteriorate from this practice, and as less palatable and nutritious species replace more desirable species such as the once dominant red grass *Themeda triandra.*

Fires also result in the destruction of vegetation and a subsequent increased surface run-off of rainwater, with less being absorbed by the soil. This leads to soil erosion and a lowering of the water table, causing the vleis and sponge areas to decrease in size. Apart from these subtle and insidious effects, fire may have a dramatic immediate effect on wildlife. Wattled cranes, for instance, may breed at any time of the year and eggs, chicks or flightless moulting adults are cremated each year.

WARWICK TARBOTON

"Spring is heralded by clouds of smoke as extensive areas are burnt."

There is no denying, though, that fire is an important natural factor in the grassland ecosystem and as such plays a vital role in the life cycle of many species. It serves to get rid of moribund grass sward, recycle nutrients, and stimulate the growth of many species of forbs with underground bulbs, tubers or corms, such as the fire lily *Cyrtanthus tuckii,* which only flowers after a burn. There is a subtle difference, though, between the long-term effect of natural fires, which may only occur once every few years and that of regular man-made fires which may burn once or more every year.

WARWICK TARBOTON

"Many examples of plantations encroaching on the sponges can be seen on the Steenkampsberg."

Much of the eastern escarpment of the Transvaal with its high rainfall is ideally suited for commercial timber production. Fortunately, the Steenkampsberg, on account of the generally shallow and leached soils, is considered marginal for forestry purposes. Nevertheless thousands of hectares of alien pine plantations have been established north of Belfast and at Santa, on the Lunsklip Spruit. In the past little consideration was given to conservation planning in the plantations and even some of the highly sensitive ecotones between sponges and grassland have been planted to pines. Many examples of plantations encroaching on the sponges can be seen on the Steenkampsberg. Plantations have a marked effect on the soil/moisture relationship, tending to dry out the soil and lower the water table. In significant water production areas such as the Steenkampsberg plateau, careful ecological planning and discretion in the siting of plantations is required so that their impact on the natural environment, especially on the important vleis, sponges and water courses will be minimised.

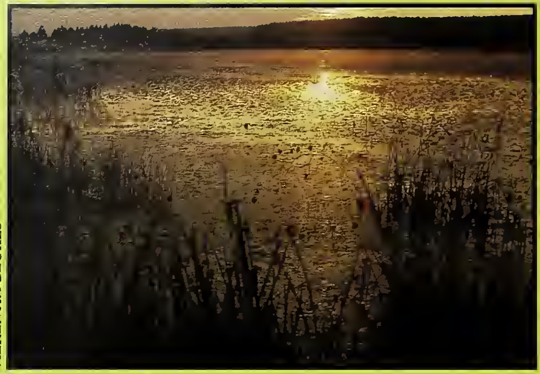
Of all the land uses (road building, dam construction, mining and urban and industrial development excluded) forestry has the greatest permanent and widespread impact on the natural environment. Most of the species naturally occurring on the

CHRIS NEL

"... infestation of the surrounding natural areas by a variety of aggressive alien species such as black wattle, pines and gum trees."

Steenkampsberg have evolved on open grasslands and cannot adapt to the shaded forest type of environment. Compared to the surrounding grasslands, the monoculture pine plantations are sterile and barren in plant, insect, amphibian, reptile, bird and mammal life.

A phenomenon peculiar to alien plantations and trees planted as windbreaks or shelter is often overlooked, as the effects are somewhat insidious and only really noticeable over a long period. They act as the source of infestation of the surrounding natural areas by a variety of aggressive alien species, such as black wattle *Acacia mearnsii,* pines *Pinus* spp. and gum trees *Eucalyptus* spp. Much of the Steenkampsberg is fortunately still free of this creeping green cancer, but this should not be a cause for complacency. The effect of these aliens on South African systems is well known and will not be expanded upon here. Suffice it to say that unless timeous action is taken, those responsible for the management of the future Steenkampsberg will be faced with a problem of insurmountable proportions.


VIERENTIA BEUKES

"Tragically, many of the sponges and vleis ... are potential dam sites."

Contrasting sharply with much of the rest of the Transvaal, the Steenkampsberg is blessed with a cool summer climate and a high rainfall. These conditions, together with cold winters and a very favourable topography make the Berg and surroundings one of the finest areas in the Transvaal for trout angling. As most of the streams are too small to support a viable population of this highly sought-after but alien fish, many have in recent years become impounded and the trend is accelerating. In the last few years the number of trout dams on the plateau alone has increased from 72 to at least 140.

Tragically many of the sponges and vleis, which are so vital to the ecology of the Berg, are potential dam sites. The most obvious effect of a dam is to flood the area of a sponge and possibly inundate a crane nest site. As these breeding sites are traditional and as there are a limited number of suitable breeding sponges available, the chances of a displaced pair finding another nesting site are remote.

When breeding, cranes are very wary and the mere presence of a human in the vicinity is enough to cause nest desertion. Cranes have been seen leaving the nest at the approach of an intruder more than one kilometre away and not returning as long as the intruder was in sight. One angler visiting a trout dam for only an hour during the 42-day incubation period is enough to terminate a breeding attempt. Trout dams require access roads, and this inevitably implies more human disturbance. The siting and construction of new dams on the plateau needs to be carefully controlled if the integrity of the Steenkampsberg as a natural area is to be maintained.

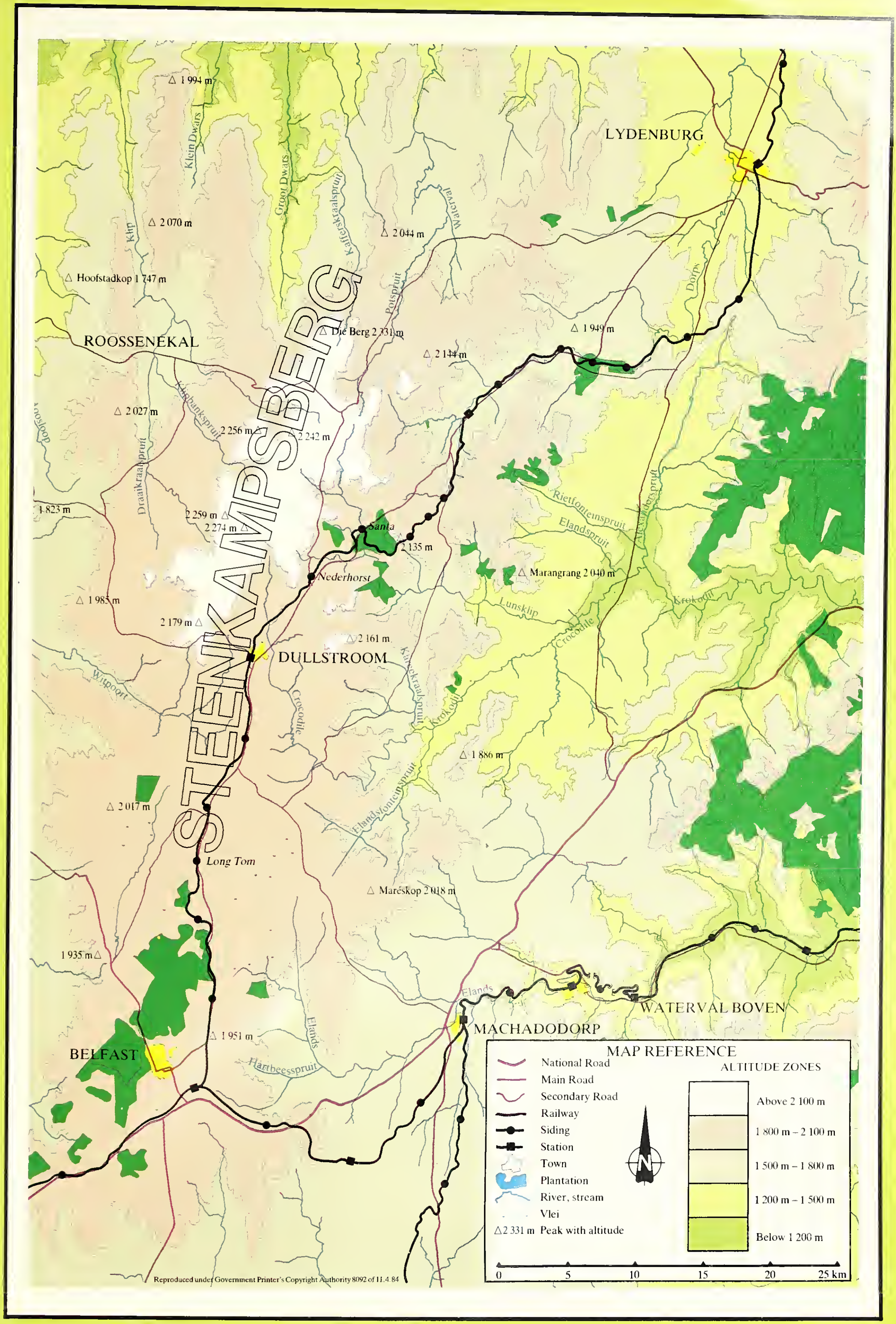
On account of their relatively small size due to the unfortunate practice of subdivision, most of the portions of land on the plateau are considered to be uneconomical farming units. This is having a marked impact on the wildlife. In an attempt to make ends meet, many farmers utilise even marginal areas for pasture and the cultivation of crops, thereby impoverishing the natural floral diversity and ecological value. Direct conflict between farmers and wildlife often arises, especially when cereal crops are grown. Cranes, ducks and geese in particular are attracted to these lands and due to their small size considerable local damage may lead to relentless persecution of the culprits. Considering the ecological importance of the plateau and its minimal importance as a cash crop producing area when compared to other areas on the Highveld, crops not attractive to wildlife should be encouraged. Additionally, as the conflict takes

WARWICK TARBOTON

"... considerable local damage may lead to the relentless persecution of the culprits."

CHRIS NEL

"Alien vegetation ... flourishes on these disturbed areas, creating further sources of infestation."



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JOHN BAKKER

place over only a limited period of time, methods of bird dispersal should be investigated.

Functional and economic considerations are all too often the sole focus of the land-use planning and utilisation of any area, with aesthetics being ignored or at best taking a back seat. Witness some of the livid scars left on the landscape by the construction of a new road and the attendant quarrying activity. New roads into wild, inaccessible country bring the unspecialised motor tourist by the horde, many lacking the ecological sensitivity and appreciation for the area, with littering, vandalism, plundering of wildflowers and accidental veld fires to boot. Bare earth road banks are loci of soil erosion and a source of silt to choke streams lower down. Alien vegetation such as black wattles flourish on these disturbed areas, creating further sources of infestation. Many more examples can be cited, and it is clear that wise and balanced planning and utilisation could avoid many of the earlier mistakes.

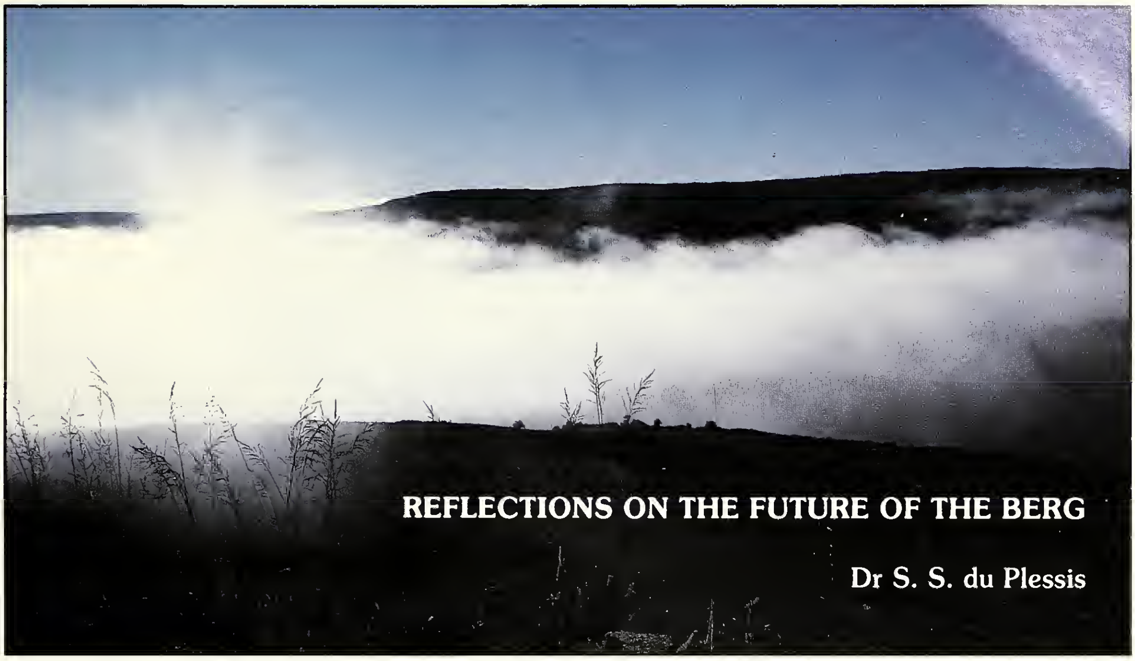
Throughout the world nature conservation and the maintenance of wild areas is becoming recognised as a legitimate form of land use, on equal footing with forestry, agriculture, mineral extraction or residential development. Unlike all other forms of land use, conservation of an area does not close future options. A National Committee for Nature Conservation was established almost a decade ago to co-ordinate conservation in the Republic. Recently the first national priority list of areas requiring conservation attention was prepared and the Steenkampsberg was ranked the second most important area in the country. If the integrity of the Steenkampsberg is to be maintained, a holistic planning and management approach is essential. Should the present trend of land-use for short-term financial gain continue, we will all be the poorer in the end.

CHRIS NEL

"New roads into wild, inaccessible country bring the motor tourist by the horde . . . with littering, vandalism, plundering of wildflowers and accidental veld fires to boot."

JANET MATTHEWS

". . . nature conservation and the maintenance of wild areas is becoming recognised as a legitimate form of land use . . ."



CHRIS NEL

REFLECTIONS ON THE FUTURE OF THE BERG

Dr S. S. du Plessis

> **"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."**
>
> **Aldo Leopold 1887-1948**

RECENTLY a pastoralist expressed concern over the disappearance of a number of the more desirable grass species from parts of the Steenkampsberg, no doubt as a result of annual heavy grazing pressure during the summer, combined with regular burning. While the dense grass sward of the Steenkampsberg is famous for its great resilience to grazing, it stands to reason that heavy grazing year after year will eventually deplete the best grasses and benefit the less palatable species.

I have vivid memories of travelling by train over the Steenkampsberg on a morning in November. It was like driving through a garden of wild flowers. However, it was significant that the flowers grew mostly in the railway reserve. This could be attributed to regular burning in the absence of grazing. I was struck by this highly visible effect of sheep grazing on the vegetation, and tried to picture the Steenkampsberg in its pristine state.

This plateau is a vitally important catchment area and water production and conservation should be the primary consideration in land use.

If one accepts that the Steenkampsberg will be systematically altered by man then it becomes imperative that a witness section of this mountainland with its vleis be set aside as a conservation area where nature is relieved of the influence of man. Unless this is done there will be no benchmark from which the effect of human pressures can be gauged, and nobody will know if and how much deterioration is taking place.

If the past is used as a yardstick, then the future will most probably bring more trout ponds, more alien plantations, and inevitably more people. This could lead to the disappearance of the shy wattled crane from its last stronghold in the Transvaal, unless landowners can be made aware of this bird's need for solitude.

The plateau has become a popular holiday area and large portions are used solely as holiday farms, with the emphasis on trout angling. While this may be a luxury which few can afford, it serves to give the land a rest from annual burning and heavy grazing, thus contributing to its conservation. It is imperative that these absentee landowners be brought together to discuss and co-ordinate conservation on their land, as they could make a highly significant contribution in that field. An optimistic vision of the future of this unique area is a place where wide open rolling grasslands remain, where wattled cranes feed amongst the sheep while male bustards display on the hills. To achieve this ideal it needs to be proclaimed as a mountain catchment area and a natural area, a place where man is in harmony with his environment. ◆

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Front cover: Blackshouldered Kite *Elanus caeruleus* feeding nestlings. A common species throughout the Transvaal but most abundant on the Highveld and in the cultivated parts of the Bushveld
Photo: Peter Barichievy

Back cover: *Helichrysum*. Photo: Janet Matthews

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LORNA STANTON

How Much Land for Conservation?

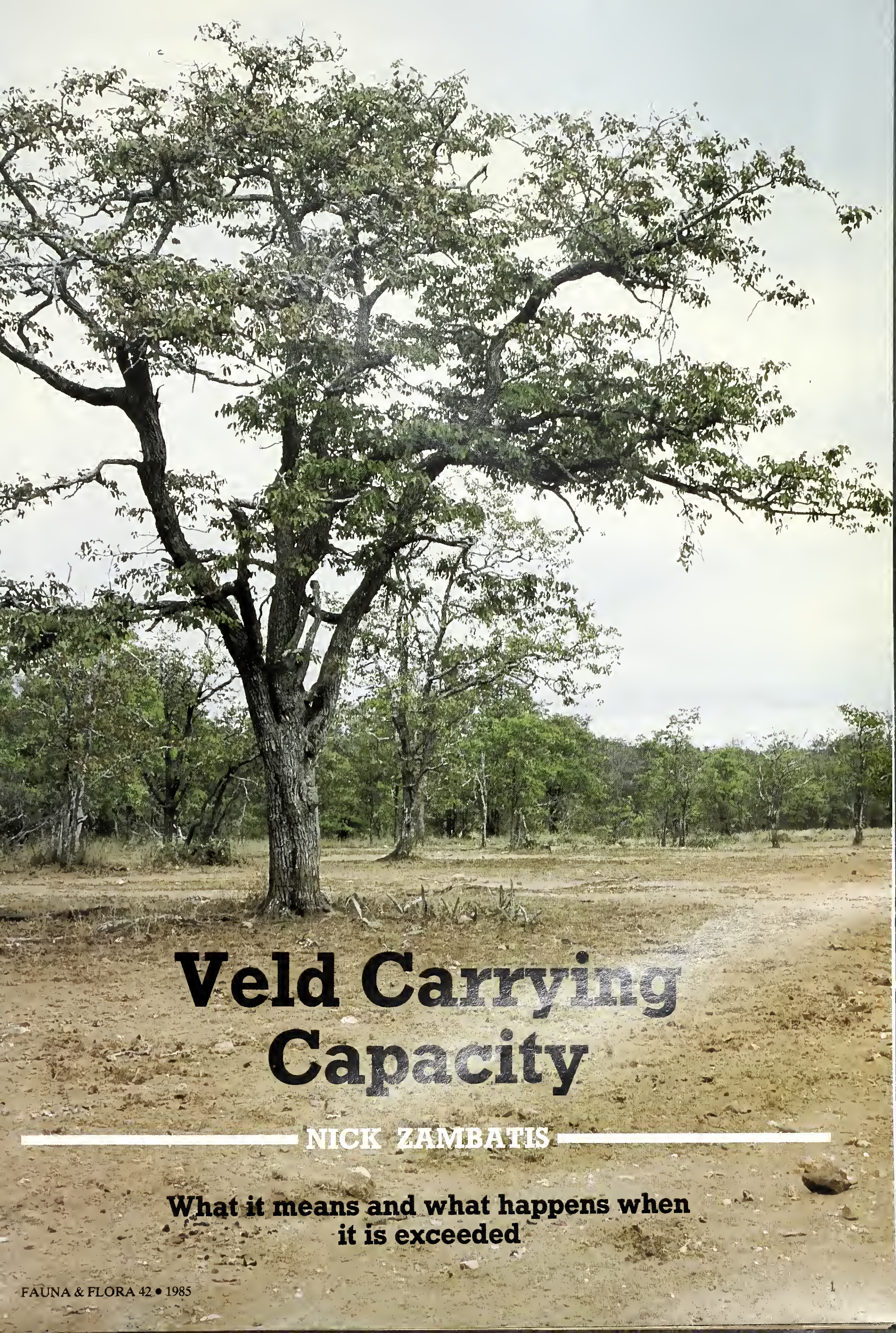
THE International Union for the Conservation of Nature and Natural Resources (IUCN) recommends that each country should aim at setting 10% of its surface area aside as national parks and nature reserves.

This idea captured the imagination of conservationists the world over and since then comparisons of the percentages that different countries had set aside for this purpose have continuously been made. There is even a tendency to judge the standard of conservation in a country by this percentage. It resulted in those countries with a favourable percentage being highly esteemed while conservationists in countries falling short of the 10% figure started clamouring for additional land to be set aside in order to reach this goal.

In South Africa we have not lagged behind and the fact that only 4,5% of our land area has been set aside for conservation is often used to maintain that we do not come up to world standards. However, to reach the 10% ideal 5,83 million hectare of land will be required. To purchase this amount of land will absorb the total budgets of all the conservation bodies in the country for 30 years. South Africa cannot justify this enormous expenditure in terms of land and money.

The National Plan for Nature Conservation aims at conserving at least one viable example of each important habitat in the country. This plan, which forms an integral part of the respective regional plans, offers a more logical and attainable objective for the reservation of conservation areas. The Transvaal Nature Conservation Division supports this approach. Quality rather than quantity.

S S du P



Veld Carrying Capacity

NICK ZAMBATIS

What it means and what happens when it is exceeded

JANET MATTHEWS

A slow, painful death by starvation

VELD carrying capacity is the ability of the veld to support a certain number of herbivores or plant eaters. It is also known as the *stocking capacity* but differs from *stocking rate*. It is finite, as will be explained later.

Carrying capacity concerns a host of complex interrelationships between the vegetation, herbivores and the environment. The inherent ability of the veld to support a certain number of herbivores is determined, amongst other things, by factors such as climate (such as precipitation and temperature) and the basic vegetation or veld type (for example, whether it is grassland or bushveld, Karroo scrubveld, or semi-desert). The veld type is in turn a product of the climate, geology and soil, altitude, slope and aspect. It will be noted that none of these factors can be controlled by man, at least not on a large scale, which is an important point to remember.

Perhaps the most important criterion in determining an area's carrying capacity is the vegetation: not only how much there is, but how suitable it is as a food resource. Many people hold the erroneous view that game simply eat grass and leaves — any type will do. This is not so. Most species, in varying degrees, have preferences for certain plants. An overlap exists between some species, resulting in a degree of competition for the same food resource. Wild herbivores can be divided into three main groups. Grazers, such as buffalo, white rhino, hippo, zebra and wildebeest, feed almost exclusively on grasses. Mixed feeders, such as elephant, impala and duiker, feed on grasses, fruits and the leaves of shrubs and trees. The third group is the browsers, feeding primarily on leaves of trees and shrubs. Examples are black rhino, kudu, giraffe and bushbuck.

A knowledge of feeding preferences — what and how much is eaten —thus enables us to determine which species of wild herbivores, in what numbers and in what proportions to each other, a given area can support on a sustained basis without that area being overutilised and damaged. In other words, the carrying capacity or stocking capacity. This is usually based on a normal dry season, which in the summer rainfall regions is the bottleneck as far as food availability is concerned.

When the carrying capacity is exceeded by overstocking and thrown off course, a sequence of events is set in motion in which, unless the telltale signs are noticed and prompt action is taken, disaster ultimately overtakes both the animals and the veld. Many of the symptoms are insidious, taking several years to become apparent. The inexperienced eye fails to detect the subtle signs in the vegetation and game that something is amiss, that the finely-balanced spinning wheel has developed a wobble.

The immediate and most noticeable symptom is the abnormally poor condition of the game in the dry season. Malnutrition weakens the animals' resistance to disease and parasitic infestation. It may cause direct mortality, or the animals simply starve to death. Overstocking, coupled with drought conditions, can decimate a herbivore population. This has, in fact, happened during the present drought in parts of the Transvaal Lowveld and Bushveld where the populations of some species have plummeted by 95%! In the case of rare herbivore species, fierce competition with numerically more dominant species, together with drought, place extreme stresses on their very survival.

An erroneous view held by many landowners is that carrying capacity is directly proportional to drinking water availability. Carrying capacity, it must be remembered, is inherent in the quantity and quality of the available vegetation and no number of additional drinking points can alter this fact. It is true that artificially supplemented drinking water can increase the stocking rate by allowing water-dependent herbivore species to utilise areas which, at least in the dry season, would otherwise not have been utilised due to the absence of natural drinking water. A point is soon reached, however, where an area is saturated with herbivores, so to speak. Beyond this point food, and not drinking water, is the limiting factor.

Selective grazing has inherent dangers. When veld is heavily or excessively stocked, the more palatable or preferred grass species may be severely damaged and even totally eliminated by overgrazing and trampling. In a sense, grazing animals under confined conditions exhibit a unique relationship with their environment. By grazing they remove that part of their environment that makes their very presence in the area possible. This then, is the crux of the problem. How much vegetation can safely be removed, and by how many animals, before the carrying capacity is exceeded and the veld is damaged?

In pasture management, a general rule of thumb is that a grass tuft must not be grazed upon more frequently than once every six to eight weeks. This, together with the fact that (in contrast to those of a herd of cattle) the movements of wild herbivores are difficult to control, partly explains why certain pasture scientists recommend stocking rates for wild grazers as being two to three times lower than those of domestic animals. With domestic stock, it is possible and normally safe to overstock an area temporarily. This is known as a high-intensity, short-duration grazing system. It is practical because a very strict control can be maintained over veld utilisation, as it is a relatively simple matter to round up a herd of stock and drive them into an adjacent camp. In the case of free-ranging wild game, this is obviously totally impractical.

Competition and selective grazing by game is not the only cause of a decline of preferred grass species. Competition for food, water and sunlight occurs continuously amongst plants as well. Moreover, grasses are generally far more aggressive and successful competitors than woody plants, provided they are not weakened by over-utilisation. Thus, when overstocking causes a decline in the more palatable grasses, less palatable vegetation such as annual weeds thrives

DICK WOLFF

Exceeding the carrying capacity damages the veld

TRANSVAAL NATURE CONSERVATION DIVISION

Judicious burning is an accepted method to control bush encroachment

under these conditions of reduced competition, thereby suppressing the remaining desirable species even further. The reduction of herbivore numbers at this late stage will have very little immediate effect in reversing the trend. On the contrary, when this advanced stage is reached it is too late to take preventive measures — long-term damage to the veld has taken place. All that can be done now is to reduce herbivore pressure drastically in the hope of preventing even further damage. The overall result is thus the natural long-term reduction of the carrying capacity, which may take many years to recover to its former level, if it ever does.

When one considers the consequences of overstocking, the tendency is to think only of the interaction between the larger, more conspicuous and perhaps more spectacular species and their habitat. It is often forgotten that a host of smaller animal species, such as insects, reptiles, amphibians, rodents, small carnivores and birds, play a rather unobtrusive and yet extremely important rôle in the highly complex web of life in nature. These lesser creatures are as dependent as an elephant, or for that matter a lion, on the soil and vegetation. They too suffer from the consequences of overstocking by larger animals, even though this may not be readily apparent. At the same time, abnormal decline of small animal populations may have a negative effect on larger animals in seemingly totally unrelated ways. Many of these relationships still remain to be discovered and understood.

Overstocking, together with certain other factors, is one of the major causes of bush encroachment. This takes place via the process mentioned above when woody species are left to take over largely unhindered. Like a scab forming over a wound, the ground becomes covered with a relatively dense layer of bush and thus the grazers which caused the wound in the first place are forced out or drastically reduced in numbers. Overstocking and the resultant bush encroachment has ruined millions of hectares of prime grazing veld in South Africa. Periodic and judicious veld burning is an accepted method of bush encroachment control, but how does one burn the veld when there is just no combustible material, in other words grass, left to burn? And so the problem worsens even further.

Overstocking has other less apparent consequences which are just as important and detrimental to wildlife as the reduction of food quantity and quality. The soil, on which most terrestrial life ultimately depends, can suffer seriously. Trampling breaks up the soil structure, leading to water and wind erosion. In many parts of the country, rainfall often occurs in the form of high-intensity, short-duration cloudbursts. As far more water falls than the soil is capable of absorbing in the same time span, these storms may cause extensive damage to the physical structure of the soil. "So what if soil is lost?" you may ask, "there's lots more underneath". Few people realize that it takes between 2 000 and 7 000 years for a topsoil layer 20 cm deep to develop. The topsoil layer is the most valuable part of the earth's crust as far as the production of plant matter is concerned. It is here, in this extremely thin layer, that many plants obtain their nutrients and moisture and that nutrients from dead organic matter are recycled. Deeper down, the soil becomes progressively drier and more sterile, elements and minerals being locked in solid rock and thus unavailable to many plants.

When the topsoil layer has been lost, the exposed subsoil is colonised by a few hardy pioneer plant species, usually sparsely spread and in most cases almost worthless as a food source. And so starts a very long and slow healing process.

Apart from soil loss, trampling has the effect of compacting certain soil types, forming a hard, almost impervious layer. This means that the already reduced quantity of surface water potentially available for infiltration into the soil is unable to penetrate deeper than this compacted layer. If it does not run off (and so cause gully erosion), it remains on the surface, only to be rapidly lost to evaporation. Soil moisture is thus reduced and this, together with the compaction of the soil itself, makes successful establishment of grass cover very difficult.

A good grass cover plays the vital rôle of absorbing much of the impact energy of rain, acting as a buffer to reduce the loosening effect of the raindrops on soil particles. Another important function of a good grass cover is that it retards the downslope movement of water on the ground and retains it so that it can infiltrate the soil. It has been determined that only 30% of rainwater is available for this purpose, the remainder being lost as runoff or as evaporation. Once in the soil, the grass tufts provide shade and reduce loss of soil moisture by evaporation. Not all of this water is utilised by plants. Some of it penetrates even deeper until it collects on solid bedrock. This is the source in most cases of subterranean water — boreholes, springs and fountains.

In relatively arid or semi-arid areas such as the Lowveld or Bushveld the level of soil moisture is very important, even though most plant species here have adapted to survive these rather harsh conditions. Research has shown that the higher the soil moisture level, the earlier the production of new leaf growth at the end of the dry season which, for herbivores, is a critical period. Some plant species are particularly sensitive to a reduction in soil moisture — so much so that an abnormally severe reduction for even a short period can kill them. In the Transvaal Lowveld, dead leadwood *Combretum imberbe* and tamboti *Spirostachys africana* trees on the middle slopes or valleys of the rolling veld are a common sight. This phenomenon is all too often ascribed to old age or a past drought. If the area is investigated more closely, it will be seen that the soil moisture level here is relatively much higher than that of the surrounding land, sometimes even oozing to the surface as a seasonal seepage area. Now consider what happens when the area is overstocked. Firstly, the grass cover is over-utilised. In time, bush encroachment takes place and plains-loving game species are forced (or more correctly, force themselves) to concentrate on the diminishing open areas. Meanwhile, on higher ground, a similar situation prevails and when it rains, large volumes of water and soil are lost. This means that less water infiltrates into the soil, and less resurfaces further down the slope at the seepage areas. A drought is thus the *coup de grace* in the lives of many a fine tree that possibly

NICK ZAMBATIS

Overstocking causes a reduction in grass cover and enhances bush encroachment took root at the time of the birth of Christ. If the veld had been stocked within the limits of the carrying capacity before the drought, more soil moisture would have been available, thereby ensuring the survival of these trees until the next rains.

Overstocking, as already explained, has a detrimental effect on groundwater resources as well. This may not have serious consequences in a normal dry season (although it may have cumulative effects), but in a drought it can mean the difference between sufficient borehole water and a lingering death from thirst.

Before barbed wire was strung across the length and breadth of Southern Africa, game animals had total freedom of movement, moving out of an area when it was no longer worth their while to nibble at already cropped tufts of grass or when seasonal drinking water dried up. An annual cycle of to-and-fro game movement prevailed, resulting in an overall light and temporary grazing pressure. A natural rotational grazing scheme thus existed whereby a fine balance between primary producers and primary consumers was maintained. This balance had existed since time immemorial. Today fences and permanent drinking water (necessitated by the presence of the fences) are the order of the day and have resulted in confined game populations exerting their influence on their limited environments on a year-long basis. For this reason alone, it is imperative that close control be maintained on stocking rates to prevent further damage to the veld.

The periodic reduction of excessive herbivore numbers under these confined conditions and in the absence of large predators is absolutely essential. A common sentiment often heard is that an area does not have "enough" game, with little or no concern being given to the basic source of life of ultimately all terrestrial animals — the soil, water and vegetation. The vegetation, and not a wildlife biologist or some other government official, determines just how much game there should be. The task of the wildlife biologist is to investigate, analyse and provide recommendations based on *facts* derived from scientific investigation.

Overstocking has only dubious short-term benefits and ultimately leads to disaster to both the game and the veld, as is clearly apparent in vast parts of the country during the present drought.

On your next visit to any nature reserve where game can be found, bear in mind that an area *not* teeming with a variety of animals may be an indication of a healthy balance between the game and the veld. Be less critical of culling programmes. These are essential and, in fact, form an integral part of any sound conservation policy based on scientific fact and not on sentiment. "Leaving it to nature", another frequently expressed sentiment, simply does not work for one very good reason: natural population regulating mechanisms and the free movement of game have been permanently disrupted by modern man with his insatiable desire to dominate and control nature. Clearly, the two ideas contradict each other.

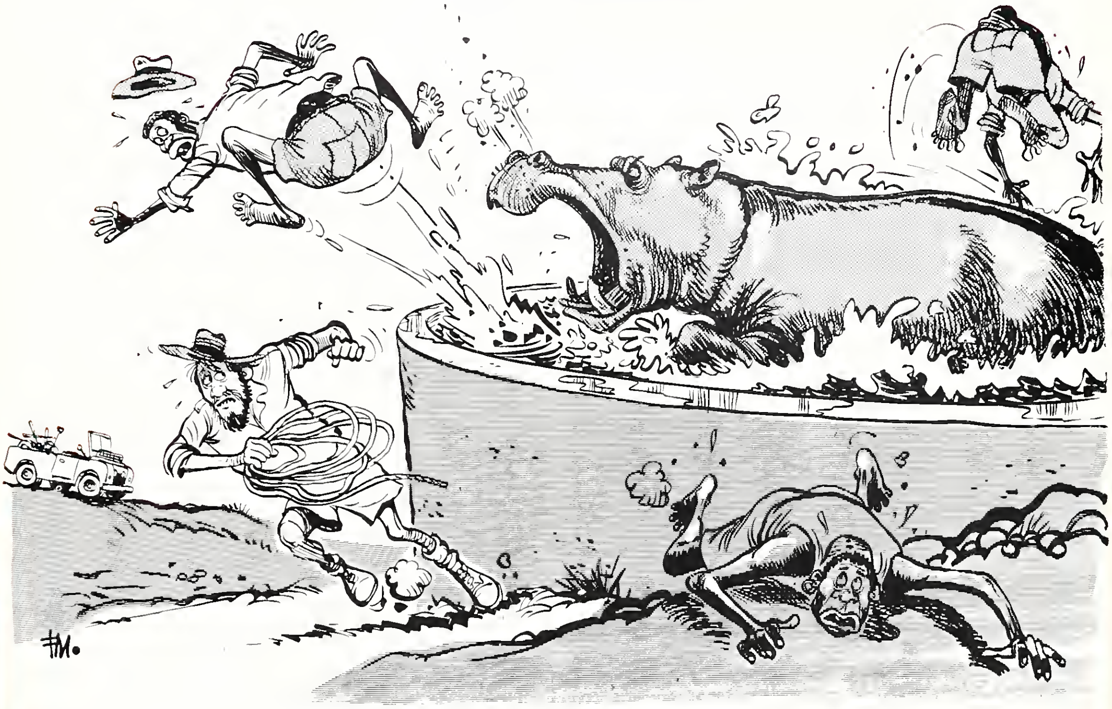
If sentiment must cloud the issue, then one last question must be asked and honestly answered by all who oppose culling: is it better to die quickly from a bullet or to die a slow and painful death from starvation and thirst? ◆

JANET MATTHEWS

Thanks to a substantial reduction of herbivore numbers the veld is recovering

Hippopotamus Antics

W.K. Kettlitz



WHEN the Transvaal Provincial Administration assumed control of the land around the Loskop Dam for the development of a nature reserve in the late forties, the Nature Conservation Division was responsible for introducing game into the fenced area.

The dam occupied a very large part of the area. As a considerable number of hippo formerly occurred in this part of the Olifants River valley, it was only natural that hippo should be resettled in the reserve.

At that time there was no method by which a hippopotamus could be caught other than by hand. Therefore everyone concerned with the task was constantly on the look-out for situations in which an animal could possibly be caught.

One day a full-grown male hippopotamus fell into a round concrete dam and could not get out again.

It so happened that this dam was in the Olifants River valley where it was used for irrigation purposes. Nevertheless, it was some 400 kilometres from Loskop Dam, near where Phalaborwa is situated today.

A method had now to be found whereby the hippo could be lifted out of the dam and transported to its new home. We quickly wove a round net of steel cable with mesh size of approximately 250 mm. The sides of the net were provided with steel rings through which a steel cable was strung so that it could be pulled shut like a large tobacco-pouch. The National Zoo provided a big crate to transport the animal in. At Dr Merensky's vermiculite mine on the farm Loole (the present day Phalaborwa) we borrowed a sturdy tripod with pulley to lift the crate with the hippo inside.

By this time the hippo was in a foul mood because of its predicament and charged every movement on the wall of the dam as far as its confined space would allow. It was a round concrete dam some 15 metres in diameter in which even a hippo could run around with ease.

First we lowered the crate into the dam, and after charging and knocking it over a few times the hippo left it alone.

Next, all manner of bait and delicacies were placed in the crate to lure the animal inside so that we could close the trap-door behind him. Nothing worked, however. For a whole day and night we tried but without success.

Then we changed to the "tobacco-pouch" tactics. The idea was to catch the hippo in the net, push it into the crate wrapped in the steel net and transport it all wrapped up, or to push the hippo halfway into the crate, cut the net loose from behind and remove it, hopefully leaving the hippo behind in the crate.

At that time we had but little knowledge of how to transport wild animals. The crate had only one door which could close from above, and the front end was solid.

By this time we had emptied the dam to approximately 300 mm so that we could also move around in it, but hopefully at least could escape if the hippo charged.

The net was then spread open flat on the bottom of the dam with one end of the cable fastened to a nearby tree. The other end of the cable was passed through the fork of a dry tree stump and attached to the bumper of a jeep.

As soon as the hippo placed its feet on the opened steel net, the jeep had to move off and close the net with the hippo inside.

The driver of the jeep could not see what was happening in the dam as the wall was too high. He therefore had to rely on a helper who stood on the wall of the dam from where he was able to indicate the position of the hippo by hand gestures.

The hippo was, of course, in top form and as soon as the net moved he simply moved off, or tumbled out of the net at the last moment.

After every failure the net had to be set up again. This wasted a lot of time because, while someone was working on it, the furious hippo had to be occupied elsewhere.

This cat-and-mouse game carried on the whole day before we finally succeeded.

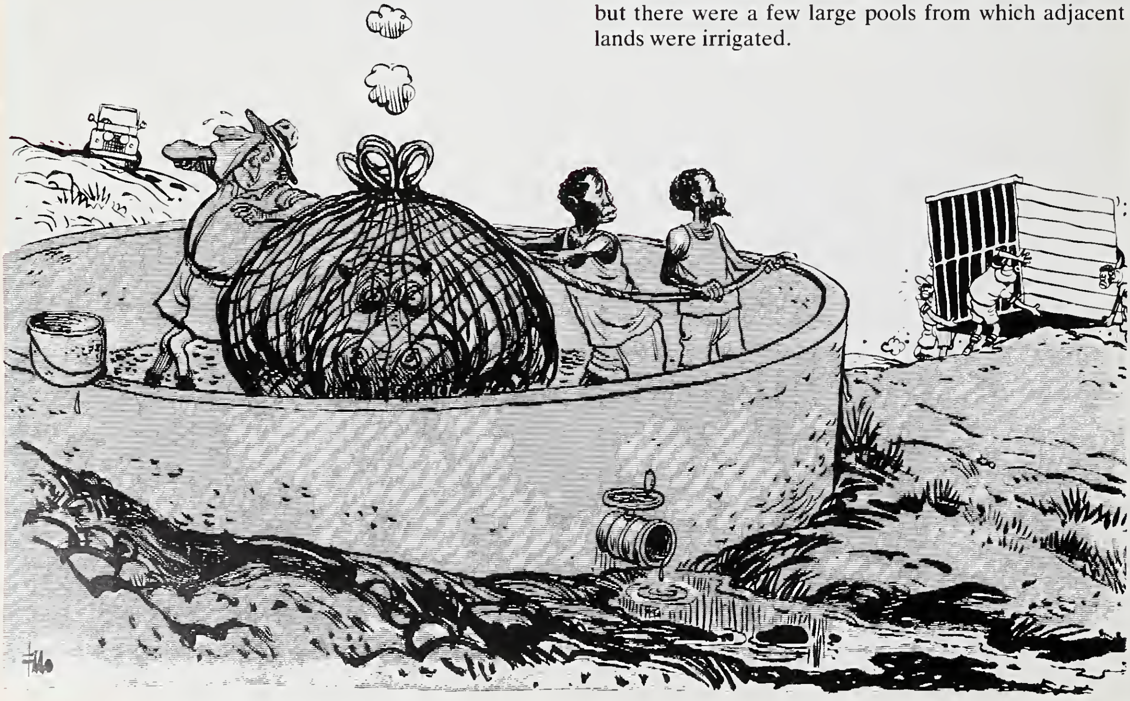
Now we faced a big problem, however. The hippo had entangled itself so tightly in the steel net that we feared that it could sustain serious injuries. In addition, it could not be lifted to the crate as we had only a tripod. Therefore we had to half carry, half drag the heavy crate to the hippo. After much struggling, sawing, cutting and plain language we finally got him out of the net and into the crate.

With much difficulty we were able to lift the crate containing the hippo out of the dam and onto the wall and finally onto the truck which then transported it to the Loskop Dam.

A report was received of a hippo cow and her young calf on a little island in the Moses River near Marble Hall.

After establishing the truth of the report we obtained permission from the owner of the adjacent land to try and catch the hippo calf.

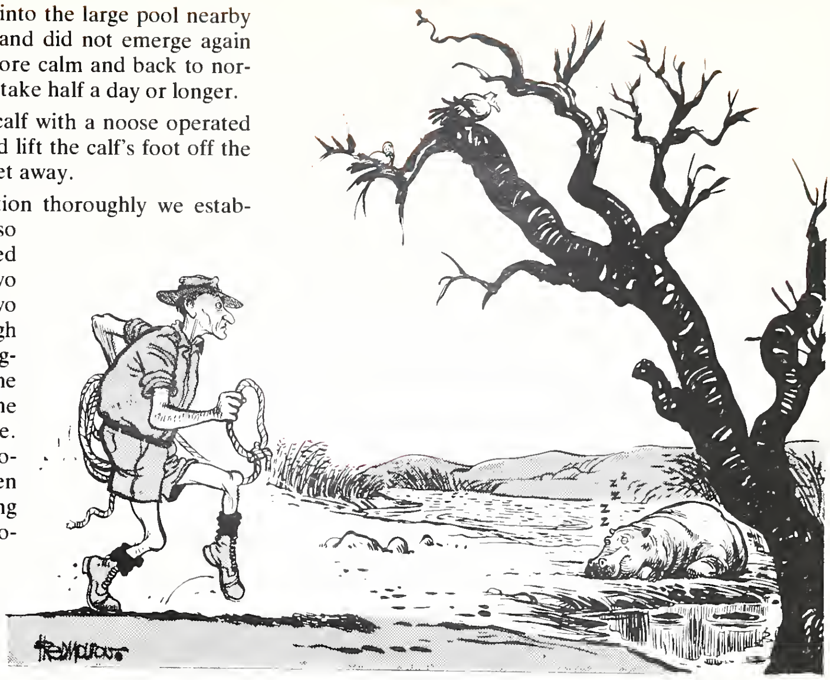
The Moses River, or Moos River as it is also known, is a tributary of the Olifants River. It is not a big river but there were a few large pools from which adjacent lands were irrigated.



The hippo and her calf fled into the large pool nearby at the slightest disturbance and did not emerge again until everything was once more calm and back to normal — something that could take half a day or longer.

We decided to capture the calf with a noose operated by weights. The noose would lift the calf's foot off the ground so that it could not get away.

Having examined the situation thoroughly we established that the calf was not so small after all — we estimated his weight at approximately two bags of sand. We hoped that two bags of sand would be enough to prevent the calf from struggling or escaping. While the mother and baby relaxed in the big water-hole we set the noose. We could not set an automatic snare as we would then stand a good chance of having to deal with an adult hippopotamus. It was to be set off by hand by rope from the bank, which would cause the two bags of sand to fall from the tree and tighten the noose around the animal.



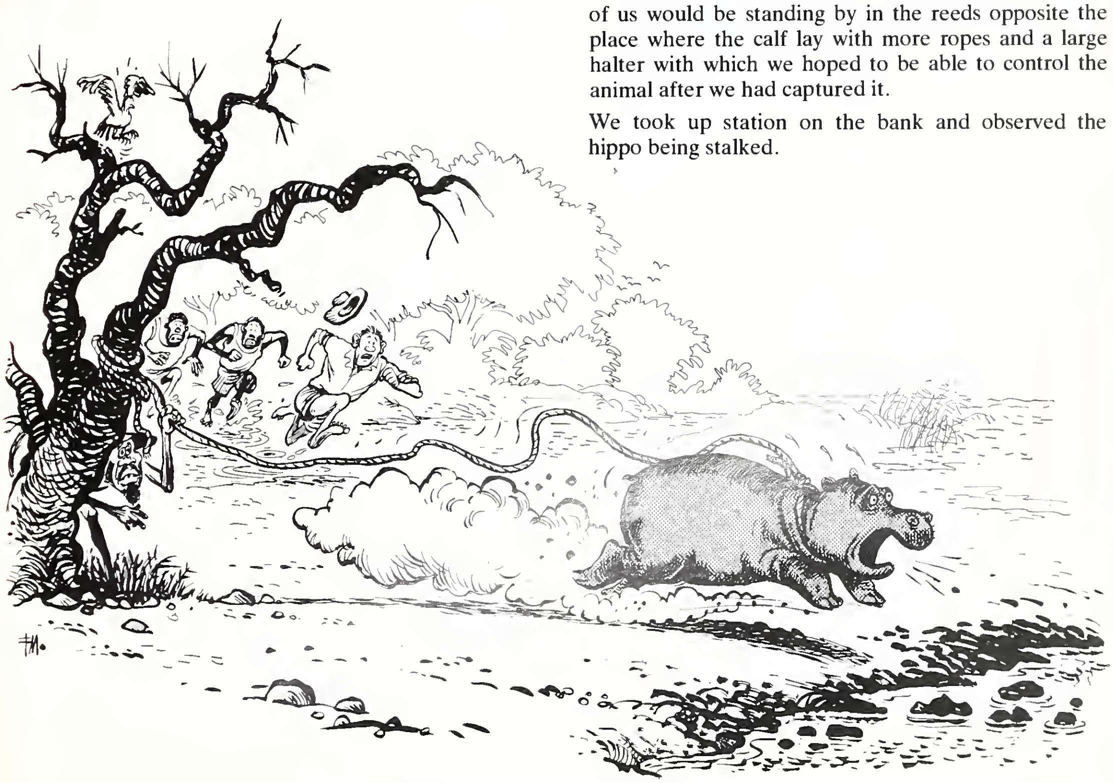
As fate would have it the hippo calf walked close to the eye of the noose several times but just would not step into it. The mother stepped into it several times, but we were not looking for trouble.

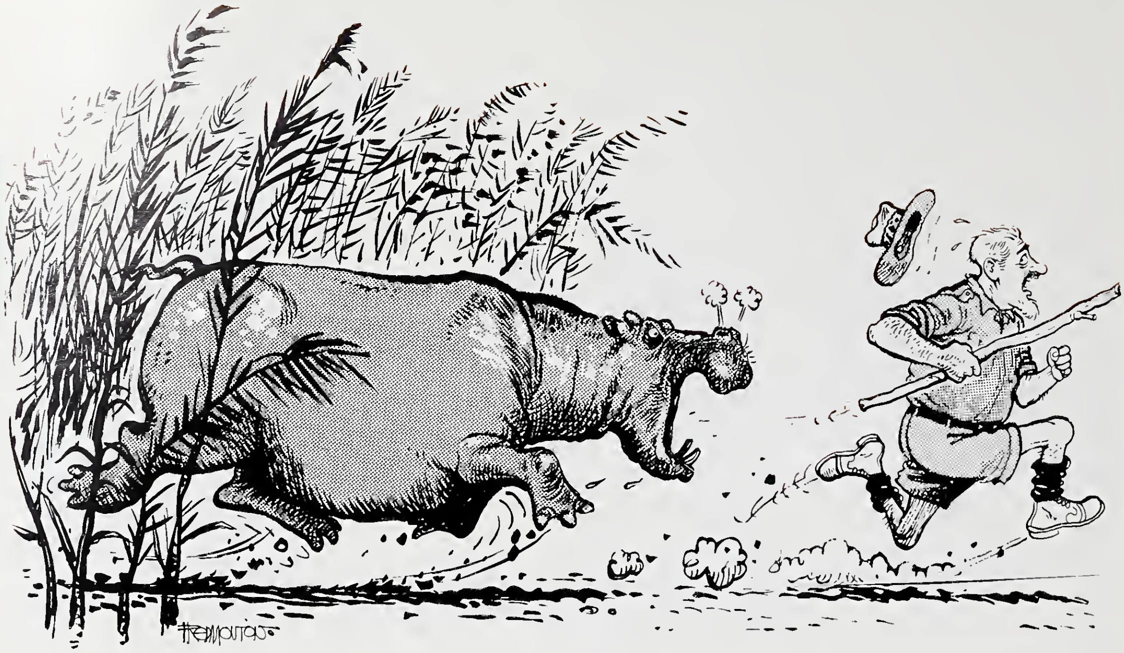
This frustrating and nerve-racking game continued for a day and a half.

That afternoon one of our scouts reported that the calf was alone on another part of the island and the mother was somewhere in the big pool. We went to have a look and indeed, there the calf lay fast asleep with its head stretched out in front.

A strategy was thus devised that one of the men, a brave fellow called Adank, would stalk the little hippo on the island, slip a noose round one of the legs, and then secure it to the nearest tree. The remaining three of us would be standing by in the reeds opposite the place where the calf lay with more ropes and a large halter with which we hoped to be able to control the animal after we had captured it.

We took up station on the bank and observed the hippo being stalked.





The calf was lying with its head on its forefoot facing Adank and fortunately the slight breeze favoured the operation.

When Adank was about 10 metres from the hippo it opened its eyes to see what was going on. After a minute or two it again felt safe and closed its eyes, whereupon Adank crept a few steps closer. Then the hippo looked up startled and stared straight at the man right in front of him, but saw no movement, not even a blink. Again it grew drowsy and closed its eyes. The tension became unbearable — the hippo again looked straight at Adank, only three paces away, without seeing him.

At this, Adank made a dive at the hippo calf and in the subsequent struggle only just failed to get the rope around its leg. He managed, however, to get the noose around the hippo's head and secured the other end around a tree.

By this time the three of us were halfway through the water to help. With an unearthly bellow the hippo made a bee-line for the water. As the noose pulled tight around the calf's head, it retreated backwards towards the water. So instead of a successful capture, we now had the spectacle of the noose neatly slipping off its head, since the neck of a baby hippo is actually thicker than the head.

The mother hippo came charging down the river pushing a wall of water ahead of her and we practically fell over one another in our frantic scrambling escape up the bank. Nor did we remain standing on the bank, but only looked back at a respectable distance to see her escort her calf away. We were unable to trace them again.

I still believe that we were very lucky not to get a good grip on the calf.

In the late forties we were instructed to drive a herd of hippo from a certain section of the Olifants River as intensive wheat cultivation was due to commence on adjacent land. Hippo and wheat have never been able to mix well.

A sergeant from the Army Engineering Corps was seconded to us to render assistance. The aim was to harass the hippos to such an extent that they would, we hoped, leave.

So day and night we caused an unearthly noise, disturbing the water and setting off booby traps and exploding crackers, all in an attempt to dislodge the herd of hippo.

After two days all the hippo, except one old bull and a cow, moved on to greener pastures. We tried all manner of disturbance and noise, even firing a heavy rifle into the water and banging stones together under the water, but to no avail.

At our wits' end we finally exploded a light charge of gun-cotton in the water. The cow at once jumped out of the water and ran down a hippo path in the reeds next to the river. Venting my relief I jumped down and ran after her and smacked her behind every time she slackened her pace. This worked well for the first 100 paces, but then the hippo decided that she'd had enough and suddenly turned round in her tracks, and now I had to run for dear life in the hippo path through the reeds to stay ahead.

Shortly before, I had seen a furious hippo bite a piece out of a rowing-boat, and the manager of the farm had told me how a hippo had with one bite dispatched a large dog in the same pool where we were now working. With the possibility of a repeat performance or a similar scene in mind I got into top gear.

The sergeant, watching this affair from higher up on the bank, maintained that I was still running at full speed long after the hippo had burst through the reeds and landed in the water. I did not stop running till I was completely above the river bank and near a good tree.

Later in the afternoon the cow simply left the water and ran away, probably to rejoin the herd. Only the old bull refused to leave.

The next day he was furious and put up a tremendous display. He did not hide away any more and was very aggressive.

Our camp was some 200 metres from the river in a ploughed wheat field under a big solitary thorn tree. Our tent consisted of a tarpaulin stretched over a rope between the tree and a pole. The sides were anchored to the ground with pegs.

Some time after sunset that night a terrific gale sprang up. Dust from the field swirled in choking clouds and obliterated the scene. The wind blew the tarpaulin down and the tent-pole fell on our only lamp which promptly and permanently ceased to function.

The small fire on which we had been cooking supper was fortunately downwind from our sleeping place and blew away spectacularly in a bright shower of sparks.

The whole world seemed to be pitch black and full of flying dust, when the old hippo bull decided to leave the water to settle an old score with us. I had never heard such a noise before and it suddenly struck me that something had to be drastically wrong with the animal.

We could see nothing, but could certainly hear him approaching. At least we had the old tree to shelter behind. The noise was suddenly right where we were and the two of us, the sergeant and I, staggered and fell over one another around the trunk in our attempts to avoid our fate.

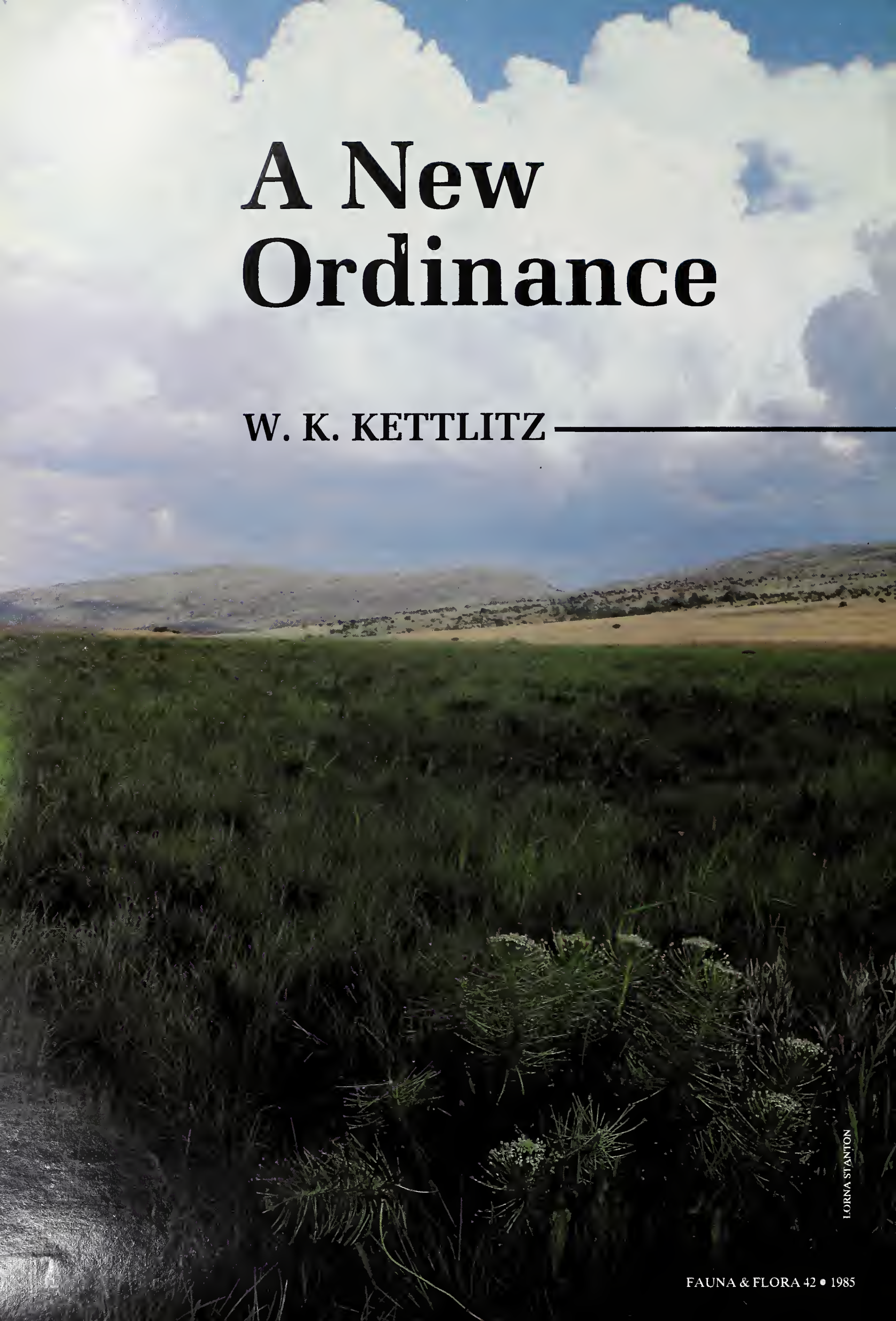
Due to the terrible wind we were unable to establish the exact position of the animal. We were sure, however, that he was on our trail to take revenge. The wind, dust, darkness and great fear conjured up a variety of ghostly snarks and boojums, probably all imaginary. It was every man for himself as every now and then I collided with someone or something in the dark as I groped my way around the tree.

This entire affair was probably over in the space of a few minutes. To me it felt like half an hour, and I was almost exhausted and soaked in perspiration when the noises were heard quite a distance away, grew fainter and finally died away. The wind also died down as quickly as it had begun. We sat for a long time in the dark, considering whether we dared light a fire. Much later we felt more at ease and threw caution to the winds so that we could put the camp in order and sort out our bedding. A mug of hot coffee had never tasted better! ◆

ARTWORK: FRED MOUTON

A New Ordinance

W. K. KETTLITZ



LORNA STANTON

LORNA STANTON

AS nature is dynamic and highly complex, its conservation can never follow a fixed static pattern and for this reason nature conservation legislation has to be altered and updated from time to time. In line with this approach a new Ordinance on Nature Conservation for the Transvaal (Ordinance 12 of 1983) came into effect on January 1, 1984.

The recalled Ordinance 17 of 1967 had already been amended on seven occasions and the regulations had been amended 15 times. As a result it had become exceedingly difficult for officials and courts, who are responsible for the enforcement of the Ordinance, to keep abreast of the latest legislative details and developments. For members of the public, who are seldom exposed directly to the Ordinance, the situation had become even more confusing.

Circumstances surrounding nature conservation had changed so significantly since the previous Ordinance came into effect that it was no longer practical merely to consolidate all the amendments. New legislation had to be drawn up to cater for a number of new problems.

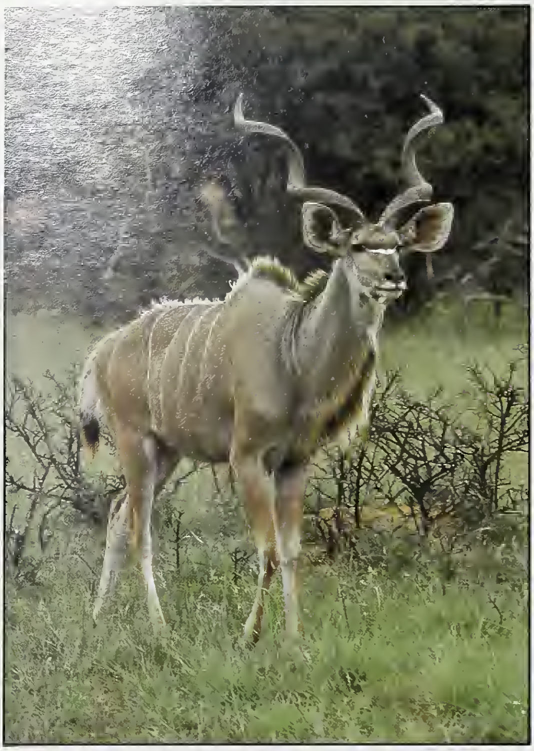
The new Ordinance strives to provide for the balanced and judicious use of its renewable natural resources by all the inhabitants of the Transvaal. By natural resources, we do not imply only those with tangible value, but also those with aesthetic, educational, scientific and other values that can be drawn from nature. Great care also had to be taken to ensure that the new legislation did not come into conflict with the basic principles of conservation.

Fundamentally the new Ordinance does not differ much from the previous one. The new and additional or supplementary provisions are specifically aimed at new circumstances and the problems created by them. Although a number of additional definitions have been added to the new Ordinance, most of these were old concepts incorporated in previous legislation. Definition of concepts such as *keep, day, night, relative, stock,* and others contribute to the streamlining.

In Ordinance 17, the concept *hunt* also included *catch*. In the new Ordinance the two concepts are treated separately for administrative purposes.

The most important new provisions in Ordinance 12 of 1983 are the following:

- The concept *close season* has been replaced by the concept *open season*. In Ordinance 17 the Administrator had the authority to declare a close season for ordinary game. This is, however, a negative concept. The hunter needs to know what species he may hunt, when he may hunt it, and not what he may not hunt. The declaration of an open season meets the hunter's requirements.
- A new category of *wild animal*, namely *protected wild animal*, is incorporated as a separate schedule. These are species requiring strict conservation but which, due to the fact that they sometimes cause damage to property, may be hunted by farmers under certain circumstances.
- The robbing of carcasses from large carnivores by certain population groups for their own use, especially along the boundaries of the Kruger National Park, can now be controlled. This practice results in the carnivore having to make another kill to obtain food. It places a great strain on the large carnivores, a number of which are already considered to be endangered species. It may also have a detrimental effect on the prey population, as a larger number than normal are caught under these circumstances. To eliminate this problem it is now an offence to pick up or remove any game carcass which had not been legally hunted, without the permission of the landowner or a nature conservator or the nearest police station. It will also help to curb the activities of poachers who illegally hunt or catch game on public or private roads in game areas, especially at night. Such a person can no longer offer the excuse that the



LORNA STANTON

antelope had been struck by a car and that he had to shoot it to put it out of its misery.

- Certain unscrupulous individuals give permission to unsuspecting hunters to hunt on "their land", knowing that it is not their land and that they have no authority to give such permission. It is now an offence fraudulently to maintain that you are the owner of land and to allow someone else to commit an offence in terms of the Ordinance.

- The transportation and keeping of wild animals under stressful and unhygienic circumstances is now an offence. It may be recalled in what an embarrassing position the Administration was placed some years ago when a local animal dealer exported a number of wild animals under such desperate conditions.

- In some Western countries it has of late become fashionable to collect and keep spiders, moths, butterflies and other invertebrate animals. If the survival of any species is threatened by this practice, the Administrator can place it in a schedule in the Ordinance so that it can receive the necessary protection.

- In terms of the old Ordinance, a hunting outfitter not operating on his own land had to obtain written permission from the landowner for every client that he wanted to hunt on that land. It is now compulsory for the hunting outfitter to obtain the hunting rights on land beforehand. This ensures that the hunting outfitter does not have to start searching around for permission once his client arrives.

- The new Ordinance makes it compulsory for each foreign hunter who hunts here to do so under the guidance of a professional hunter. The professional hunter is then legally responsible for his client's actions.

- The placing of floating objects in water as markers for illegal fish feeding places is now prohibited. These markers are a danger to boats, snarl anglers' fishing lines, cause pollution of the shores; and it is aesthetically objectionable to see bottles, tins and cans floating on the water.

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- Trout farmers can now obtain exemption for occasional anglers to angle in their dams without having to take out a trout angling licence.

- It is now unnecessary to obtain a permit to possess cultivated seedlings of cycads. Cycad seedlings are now considered to be ordinary *protected plants*. Any person possessing or transporting a seedling must be able to present an acceptable explanation as to how he came to be in possession of that plant. A letter of donation, receipt of sale, or other document to prove ownership is sufficient. When the stem, bulb or tuber exceeds 150 mm in diameter it is no longer a seedling and a permit is required to possess it. The permit will be considered only if the above-mentioned document can be presented. This permit is required only for the twelve cycad species indigenous to the Transvaal. The other species of cycad indigenous to the Republic are now considered to be protected plants, and are treated as such.

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- Anybody importing protected plants into the Transvaal requires a permit to do so. If protected plants are imported from other provinces, South West Africa or any area which was formerly part of the Republic, a permit is no longer required. Documentary proof must, however, be presented as to how the person came to be in possession of the plant.

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The individual sections in each chapter of the Ordinance are now arranged in logical sequence, as are the chapters themselves. Several chapters from the old Ordinance dealing with the same subject are now consolidated in one chapter in the new Ordinance. As a result of this the new Ordinance, with all the supplementary provisions, is no bulkier than the old Ordinance.

The regulations have also been considerably condensed and the Administrator now has authority to proclaim certain matters which had formerly to be prescribed by regulation.

The M E C for Nature Conservation thus summed up the purpose of the new Ordinance on occasion of its submission to the Transvaal Provincial Council: "The biggest challenge to this Council in the field of nature conservation is to build a good partnership with the inhabitants of the Province so that we can work along with the private sector to ensure the conservation of our heritage. It affects every inhabitant of the Transvaal, and for this reason we have a task to ensure that the principles of nature conservation, as they are internationally accepted, should never be subjugated to group interests."

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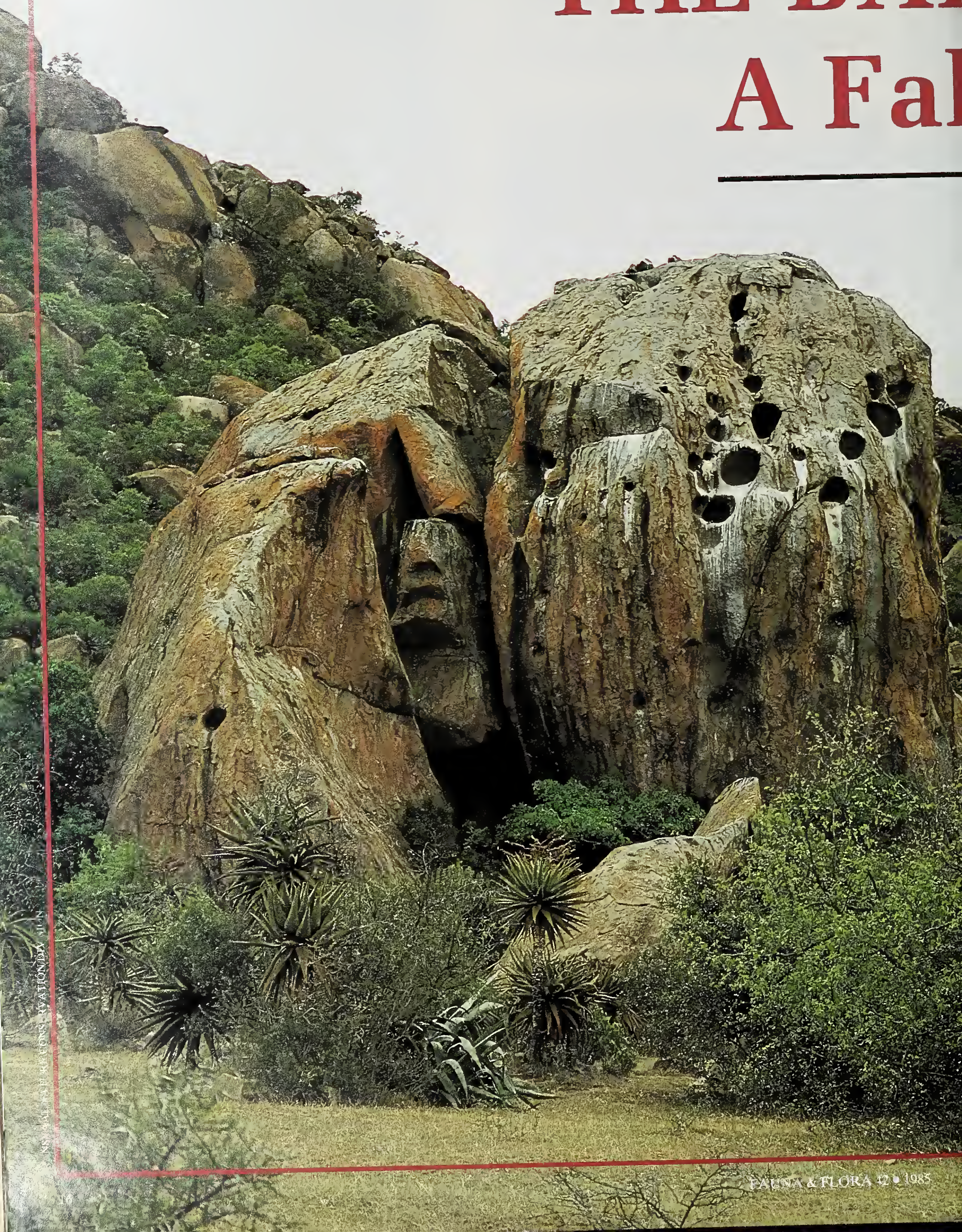

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D IBIS —
e Alarm?

DAVID ALLAN

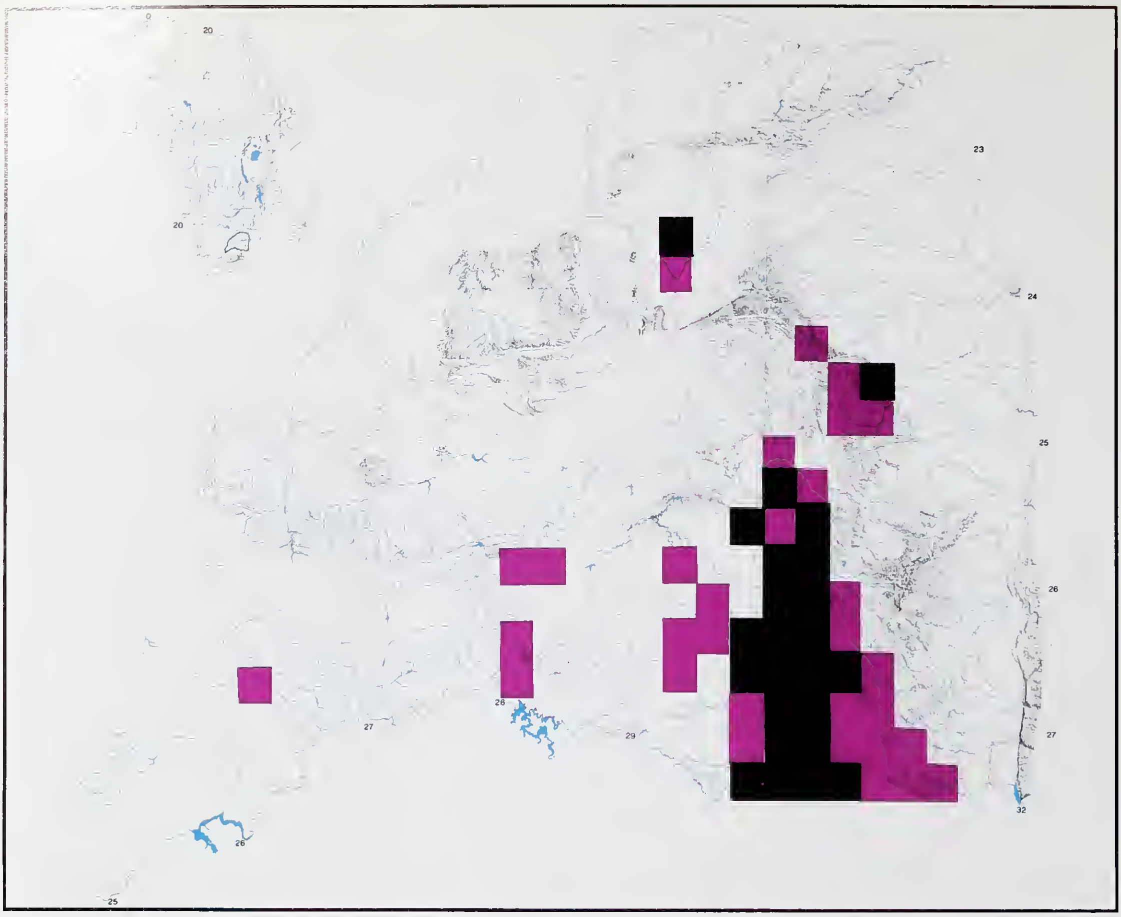
FROM a distance the bald ibis *Geronticus calvus* resembles a squat, black turkey as it forages in small parties over the short grasslands of the South African Highveld, picking up insects with its long, slightly curved bill and gulping them down with a characteristic jerk of the head.

It is endemic in this region, being restricted to the North-eastern Cape (very locally), Eastern Natal and parts of Northern Zululand, North-eastern Orange Free State and the Eastern Transvaal. Seen from close up it is an intriguing bird with iridescent blue-green plumage, red legs, naked white head and a bright crimson crown and bill. Adults can be distinguished from immature birds by their brighter crowns and brown shoulder patches. The sexes are practically indistinguishable from one another.

Unlike the other Southern African members of its family (the sacred ibis *Threskiornis aethiopicus*, glossy ibis *Plegadis falcinellus* and hadeda ibis *Bostrychia hagedash*) it forages predominantly in dry grassland and seldom in marshy areas. This inoffensive bird is in no way harmful to farming interests as it feeds mainly on beetles and other insects. The discovery of many regurgitated buttons and small bottle-tops below the nests at the Madikoto colony led Peter Milstein to speculate on whether an ibis, while foraging, occasionally mistakes a button for a beetle. In the late winter bald ibis nest colonially on cliff faces.

Concern for the bird's future was raised in 1966 when Professor Roy Siegfried published an article stating that the species "never really common . . . has receded and declined" and that "its survival, on a national basis, is threatened". He estimated the total South African population to be between 500 and 1 000 individuals, with the Transvaal holding perhaps 150 birds. At the same time he convincingly demonstrated how the bald ibis had declined from enjoying a wide distribution in the Cape Province, originally being found as far west as Cape Town, to being virtually exterminated there, with only one small colony remaining on the Natal-Lesotho border in the far eastern part of the province. The decline appears to have commenced at the beginning of the present century.

This article stimulated a great deal of interest and in 1966 and 1967 T.N. Pocock and C.J. Uys conducted a preliminary survey of the species' status in the Orange



ARTWORK: JOHN M. ANDERSON

The distribution of the bald ibis in the Transvaal based on historical and recent records. Black squares: breeding records, red squares: sightings. Each square represents a quarter-degree square

Free State. In 1968 K.N. Cooper and K.Z. Edwards did the same in Natal. These surveys, though far from comprehensive, concluded that Professor Siegfried's assessment had been too pessimistic. In the Orange Free State it was found that "the position . . . is much healthier" compared with the Cape and that the bald ibis was "still quite common in the North-eastern Free State". Similarly in Natal the situation was such that "no danger of this species becoming extinct" existed and that the bald ibis was possibly even increasing there.

In 1969 the Transvaal Nature Conservation Division initiated an annual survey of the known breeding colonies within the province. Some 14 colonies with a total of 452 birds were initially located. This was three times the number predicted in 1966 by Prof. Siegfried, who now revised his estimate to a total South African population of 2 000 breeding birds and conceded that the species "is in no immediate danger of extinction".

The Transvaal population was surveyed annually until 1977 and again in 1982, by which time 45 breeding colonies had been located. The greatest number of breeding pairs counted was 501 (1 002 birds) at 34 colonies in 1977. In 1982, 478 pairs (956 birds) were counted at 44 colonies. In addition to the breeding pairs there are an estimated 1 300 non-breeding birds, giving a total Transvaal population of approximately 2 250 in 1982.

There are thus substantially more bald ibis in the province than was at first thought. This, however, is not sufficient cause for optimism as it is the long-term population trend, not absolute population size, that finally determines survival. Is the Transvaal population increasing or decreasing?

Data from fifteen colonies monitored from 1969 to 1982 show an overall increase from 1969 through to 1977 and a slight decrease from then to 1982. This increase corresponds with a period of above average rainfall in the bald ibis' range in the early to mid 1970's. The recent drought years (1981, 1982 and 1983), with conditions similar to those prevailing in the mid 1960's, could be expected to depress the number of breeding pairs again.

These surveys have also resulted in a more accurate determination of the species' distribution range. Although an isolated colony has been found on the Pietersburg plateau and a few pairs breed in the Blyde River Canyon area, the bulk of the population (98%) is restricted to a narrow strip between the Steenkampsberg near Dullstroom in the north and Wakkerstroom in the south. This range corresponds almost exactly with Acocks' veld type 57, North-eastern

Sandy Highveld. This grassland is sour, with *Themeda triandra* as the dominant grass species in most areas. Altitude varies between 1 600 m and 2 150 m and precipitation between 750 mm and 950 mm per year, mostly in the summer months. The main form of land use is pastoral grazing (sheep and dairy cattle) with cash crop farming (mainly maize) to a lesser extent.

This region was originally a treeless grassland, explaining why the bald ibis has evolved as a cliff nester. Colonial breeding and foraging is a valuable adaptation due to the limited number of suitable cliffs and an unevenly dispersed and unpredictable food supply.

Breeding colonies vary in size, with one to 65 breeding pairs per colony recorded. Nearly half (49%) of breeding pairs in the Transvaal are concentrated at only five colonies and 71% at ten colonies. The significance of this phenomenon is that should these few colonies be threatened, a disproportionately large part of the population could be affected. Conversely, by protecting these sites, the survival of a large sector of the population could be ensured at relatively low cost.

Most of the breeding cliffs are of yellow Ecca sandstone, characterised by their chalky appearance, overhung structure and deep, rounded potholes and ledges. Cliff heights range from a mere 5 m to 67 m, averaging 24 m. Bald ibis dislike direct sunlight on their nests, especially in the afternoon, and most (71%) of the nesting cliffs face either south or east. At nests which were in direct sunlight both adults and nestlings have been observed panting in apparent discomfort.

In the breeding season courting pairs perch on the cliff ledges, nibbling each other's bills and allopreening. Copulation is accompanied by a strange, high-pitched call, the male holding the female's bill in his own and shaking his head from side to side. Noisy and protracted fights sometimes break out between neighbours over prime nest sites, the opponents parrying and stabbing at each other's heads and necks with their long bills, sometimes until blood is drawn.

The female builds the nest from material collected by the male. Nests are untidy structures of sticks lined with dry grass which soon become soiled and disintegrate with the movements of the chicks. Nests are loosely grouped together and sometimes closely spaced on large ledges. They are generally built lower down if the base of the cliff is situated above water and hence is less accessible to predators.

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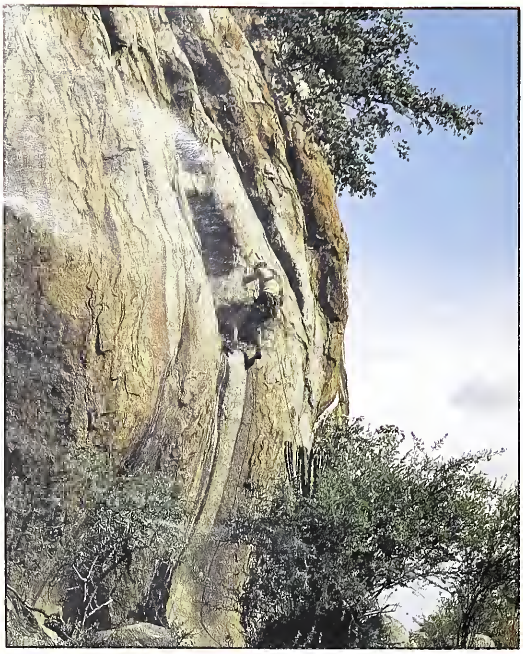
An adult bird enjoys the sun


TRANSVAAL NATURE CONSERVATION DIVISION

A colour ringing program was introduced in 1972

Breeding commences in earnest in the winter and 86% of clutches are laid between August 10 and September 20. Breeding during the winter is unusual and may be related to food availability. This is the period when most veld burning is done. Bald ibis find recent burns very productive and soon congregate to forage in such areas. The other ibis species in Southern Africa, which are more orientated towards aquatic food sources, breed in the spring and summer when water levels rise. Breeding birds in the northern colonies lay earlier than those in the south. This may be due to temperature and sunlight related factors and not to rainfall, which appears to begin simultaneously throughout the Highveld.

Clutch size varies between one and five eggs. The usual number is two (average 1,93), while more than three are exceptional. Broods vary between one and four nestlings with an average of 1,65. More than two nestlings in a nest are unusual. Fewer large than small nestlings are seen in nests, reflecting a gradual nestling mortality before fledging. This mortality usually occurs before the chicks are half grown.

On hatching, the young ibis is covered in soft brown down and is constantly attended by one of the parents, which will place a foot on top of it to still its movements when a human intruder is visible. It bobs its head rapidly to elicit food from adults. It grows rapidly and is ready to leave the nest after approximately 40 days.

Another parameter for assessing a species' status is breeding success. In 1982, 179 breeding attempts were monitored. Of these 48% were successful, rearing an

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The chick grows rapidly and leaves the nest after approximately 40 days

average of 0,7 young each. Repeat attempts after an initial failure do occur. This aspect of bald ibis' biology will be researched further in following years.

A number of causes of breeding failure has been recorded. Natural predators include jackal buzzards *Buteo rufofuscus* which kill nestlings. Cape eagle owls *Bubo capensis* kill both adults and nestlings. Pied crows *Corvus albus* and gymnogenes *Polyboroides typus* are suspected of taking eggs and young respectively. Black eagles *Aquila verreauxii* and lanner falcons *Falco biarmicus* have been observed swooping through flocks of flying bald ibis and one breeding site was abandoned when a pair of black eagles built a nest there, the ibis moving to a new site a kilometre away. Strong winds can blow nestlings out of their nests and even entire nests off their ledges. A nest, complete with eggs and incubating bird, was once observed sliding off a ledge. The rounded, sloping nature of these sandstone cliffs exacerbates this problem. One adult was found dead at a colony with its foot entangled in overhanging vegetation.

The extent of human predation and vandalism is a disturbing phenomenon at certain colonies. Eggs and young are stoned and long sticks with hooks, nooses or tins are used to remove eggs and young. Rat traps are placed above nests to catch adults. Adults and nest contents obtained in this way are eaten or possibly used for *muti* but much of the damage is pure vandalism. Evidence of shooting has been found and egg collectors are at times a problem. Inadvertent or incidental mortality due to human activity also takes its toll. Temporary desertion of one colony resulted from blasting operations during nearby road construction and nest desertion due to an inconsiderately sited photographic hide has been reported. One immature was found dead below a power pylon, possibly electrocuted.

Substantial and regular disturbance of this nature could have a potentially disastrous impact upon the overall breeding success of the bald ibis, especially as it seems more common at the larger colonies. The stationing of wardens at these colonies during the breeding season might be a solution.

In 1972 a colour ringing program was initiated to ascertain the extent of inter-colony movements, breeding age and longevity. Between 1972 and 1977, 226 nestlings were ringed at five colonies with colour combinations of between two and four rings. At least 110 of these ringed birds have been subsequently resighted when more than twelve months old. Of these, 25 were seen at least once at colonies other than those where they were ringed as nestlings. Seven of these were subsequently resighted at their natal colonies. Three individuals actually bred at colonies other than their natal ones, one for at least three successive years. The distances moved by these wanderers ranged between 11 km and 55 km, averaging 27 km. Birds of all ages between one and nine years old were involved. This movement allows for a healthy genetic interchange between the otherwise isolated colonies.

At the age of one year all ringed birds were still in immature plumage, while those seen when two years old were in adult or almost adult plumage. One of these two-year-olds was observed breeding. By three years of age, both males and females were recorded breeding. The oldest individual so far recorded was a ten-year-old bird, still breeding at its natal colony in 1982. An additional six nine-year-olds were recorded nesting in that year.

The bald ibis does not migrate in the true sense of the word but out of the breeding season, from late summer to early winter, the birds are not confined to their breeding colonies and will roost at smaller cliffs and even in trees or on power pylons, without returning nightly to their breeding cliffs. Some breeding cliffs are totally deserted during this period. This allows the birds to travel further in search of dwindling and widely dispersed food supplies during this time of the year.

In an attempt to establish a captive breeding colony, several young bald ibis were given to the National Zoological Gardens in Pretoria and in 1982 three pairs attempted to breed for the first time. The six individuals involved were all two years old, confirming the age of first breeding recorded in wild colour-ringed birds. The three females laid normal two egg clutches but unfortunately no young were hatched and a new breeding cage is to be constructed.

In conclusion it seems that, in the short term at least, the future of the bald ibis in the Transvaal is assured. There are no grounds for complacency though. Habitat destruction such as is brought about by commercial afforestation, expanding agriculture and industrialisation on the one hand, and habitat degradation leading to the invasion of Karoo vegetation on the other could, and probably will have, an ever-increasing impact. The Eastern Transvaal Highveld is undergoing rapid development due to the exploitation of its extensive coal deposits. Newly-constructed power stations with their attendant open-cast mines, dams and burgeoning human populations leave little room for wildlife. The irresponsible and widespread use of pesticides could threaten the species, as in the case of the closely related hermit ibis *Geronticus eremita* of North Africa and Asia Minor. Active protection of the larger colonies from direct disturbance and management of their foraging areas may in time become necessary.

The bald ibis is one of a group of unique South African endemic birds whose future lies entirely within our hands. Should we ever allow it to slip into extinction, there will be no second chance. ◆

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DAVID ALLAN

The future of this unique endemic South African bird lies entirely within our hands

C. FABRICIUS
and
L.G. OATES

Status of Black Wildebeest in the Transvaal

THE black wildebeest (or white-tailed gnu) is endemic in the Republic of South Africa, where its historical distribution was limited to the open high-lying plains of the central interior.

As a result of heavy hunting pressure by travellers, hide hunters and settlers in the last century and the early part of the present century, the numbers had dwindled to the brink of extinction by the 1940's. This situation deeply concerned conservationists and, after its establishment, the Transvaal Nature Conservation Division took early steps to conserve and breed this endangered species for relocation to those areas in the province where it had previously occurred. During 1979 a survey was undertaken to establish the status of the black wildebeest in the Transvaal and to evaluate the long-term outcome of this conservation program.

Historical records indicate that at the turn of the century the population of black wildebeest in South Africa had fallen to well below 1 000. Bryden (1897) had "doubted whether the few reasoning and reasonable farmers who had black wildebeest on their farms could preserve the poor remnant of the animal and be able to arrest complete extermination". Millais (1895) expressed a similar view, adding how necessary it had become to establish a game park for the preservation of the species.

Bigalke (1947) stated that there were approximately

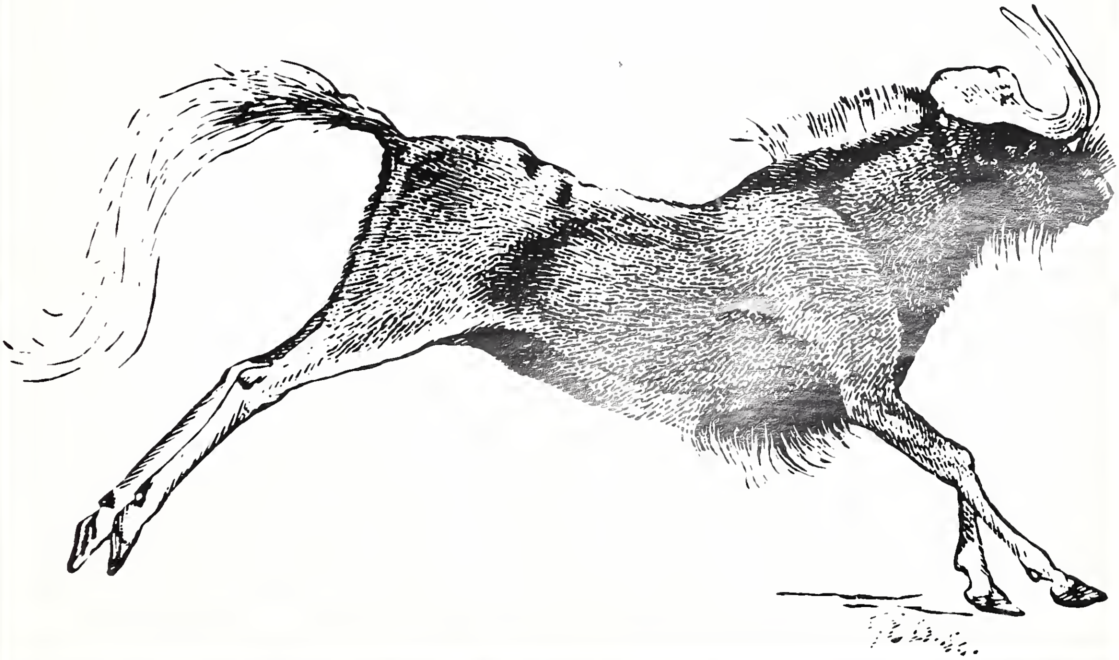
1 048 black wildebeest in the Union of South Africa in 1946. Of these only one herd of 46 animals was left in the Transvaal and these survived on the farm Honingkrans in the Wolmaransstad district. Soon afterwards in 1949, part of this herd formed the nucleus of the breeding herd which was established on the S.A. Lombard Nature Reserve near Bloemhof. During the next 30 years this herd bred very successfully and the progeny have been widely re-established in the Highveld areas.

The 1979 survey showed that there were 1 532 black wildebeest represented by 75 herds in the Transvaal. Lambrechts (1974) had recorded 39 herds with a total of 550 animals, nine years earlier.

During the survey it soon became clear that the re-establishment of some herds had been more successful than others. Many possible variables account for this. At this stage, with a relatively superficial knowledge of the animal's ecology, the precise reasons are therefore largely conjecture.

A number of factors thought to influence the success of re-establishment must, however, be taken into consideration by wildlife managers. It has, for instance, become clear from this study that the breeding success was, without exception, poor on those farms where only a small herd had been established. An introductory herd consisting of a minimum of 12 animals with a sex ratio of 1:1 is therefore recommended and 20 may be optimal.

According to Von Richter (1971) the black wildebeest is a highly gregarious species and, like many plains animals, it is territorial with a complex social organisation. Bulls other than the adult attending the cow or



nursery herds also need constant social contact with other black wildebeest. The presence of bachelor herds, consisting of males of every age class, is vital to the long-term viability of any black wildebeest population.

A factor which has apparently been overlooked previously is that, if the herd bull is denied social contact with competing neighbouring bulls, its energy is apparently expended in chasing and fighting with cows and calves, with a resultant low incidence of mating and an abnormally high cow and calf mortality.

Herds established outside their former natural range were less successful. According to historical records black wildebeest never occurred north of 25°S latitude. They appear to have preferred the open grassveld plains of the Highveld. This survey indicated that, with one exception, there are no successful breeding herds north of 25°30′S latitude, which runs slightly north of Pretoria.

The suitability of habitat is of primary importance. Black wildebeest are predominantly grazers. Certain deductions on habitat suitability can be made from the breeding success of any herd. In simple terms, the Bushveld and Lowveld veld types were shown to be unsuitable, whilst the pure grassveld veld types of the southern, central and western parts of the Transvaal favour black wildebeest.

Hybridisation with blue wildebeest can present serious problems under certain conditions. The existence of fertile hybrids of blue and black wildebeest on a significant scale was first known to occur, apart from under artificial conditions at zoological gardens, at the Krugersdorp Municipal Game Reserve. On ten farms in the Transvaal both species occur together, although this does not necessarily mean that hybridisation is taking place. The implications of relocating animals from such a herd to other areas are obvious. Farmers are strongly urged to rectify the matter as further hybridisation cannot be tolerated. Unless eliminated, it can today be a greater threat to the survival of the black wildebeest as a distinct species than hunting pressure was in the second half of the last century.

The survey showed that injudicious shooting was carried out on some herds of this highly sociable animal. The single or territorial bulls form the backbone of the social organisation of any wildebeest population and the possession of a territory is an essential prerequisite for reproduction. These bulls, because of their large size and prime condition, were frequently selected by the trophy hunter who was mostly ignorant of their important rôle in the herd. This often resulted in an inferior bull serving the cows, leading to weaker progeny. In cases where too many animals were shot from the bachelor herd, reducing the competition for the territorial bull, his resultant aggression was directed at cows and calves with subsequent losses.

Finally, the size of land on which the herd was kept was important. From the findings of this survey a minimum grazing camp or enclosure size of 100 ha is recommended. Further studies may well show the minimum size to be considerably larger.

Although the conservation of the black wildebeest has advanced remarkably in the Transvaal over the last 30 years, the status of the species cannot yet be regarded as beyond concern as certain evidence points to it still being threatened. It is of prime importance that additional viable herds be established in suitable habitat in the Transvaal and that these populations be kept genetically pure.

Regular future surveys of the status of the black wildebeest in the province will have to be undertaken to monitor the conservation trend of this truly endemic South African antelope. ♥

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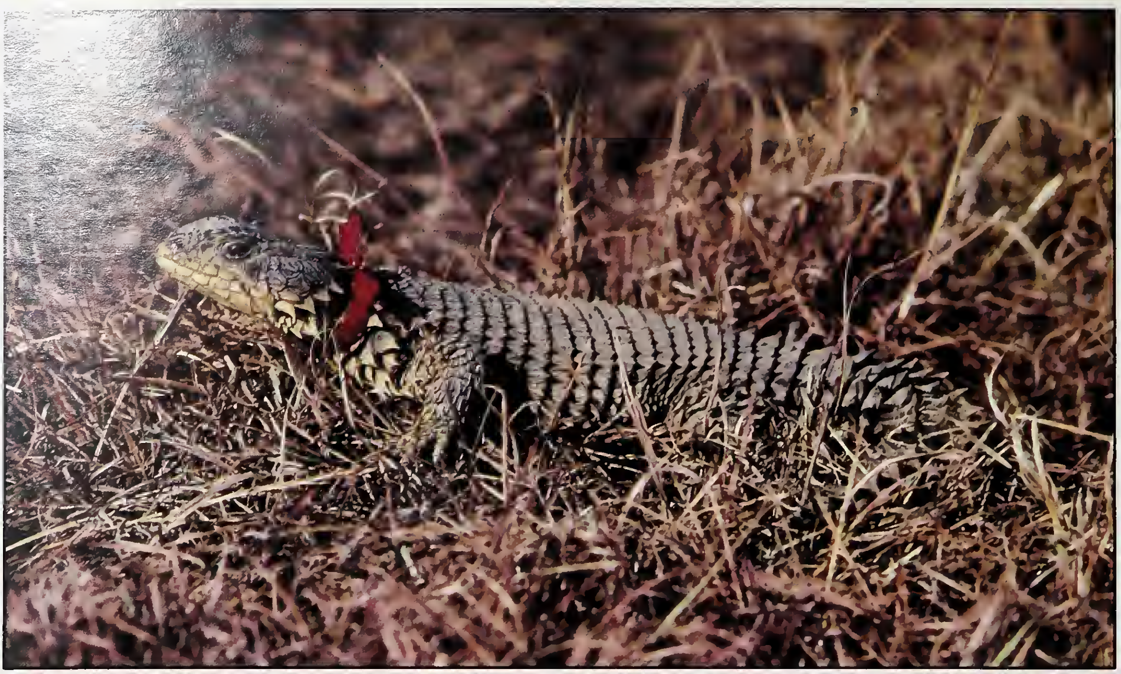


JANET MATTHEWS

Cordylus giganteus is Alive and Well and Living at Rietpoort

WALLY PETERSEN, RICHARD NEWBERY and NIELS JACOBSEN

IN disbelief you shake your head, blink, and rub your eyes. Yes, that basking lizard is still wearing a brightly coloured ribbon around its neck. Carefully you check the contents of your water bottle, at the same time trying to remember the outcome of your last medical checkup. Don't despair, these illusions are all part of an ambitious program to resettle an entire *Cordylus giganteus* population at a new locality.

Cordylus giganteus is, of course, also known by other names. The Afrikaans vernacular includes ouvolk, sonkyker and karkoerhotnot. In English it is known as the sungazer, while the Zulu name is mbedhla. This species is the largest member of the genus *Cordylus* which is largely restricted to Southern Africa and is represented by 30 species and subspecies, eleven of which occur in the Transvaal.

An adult may attain a length of 40 cm. It is heavily armoured with large keeled spiny scales, underlain by continuous rows of overlapping bony osteodermal plates situated in the dermis. The adult lizard is uniform dull yellow to dark brown above and straw yellow below with sporadic blotches of faded black on some of the scales. The juvenile is far more colourful, being dark brown with orange crossbars on the legs, back and tail. The lateral colouration is black and yellow while ventrally it is creamy yellow.

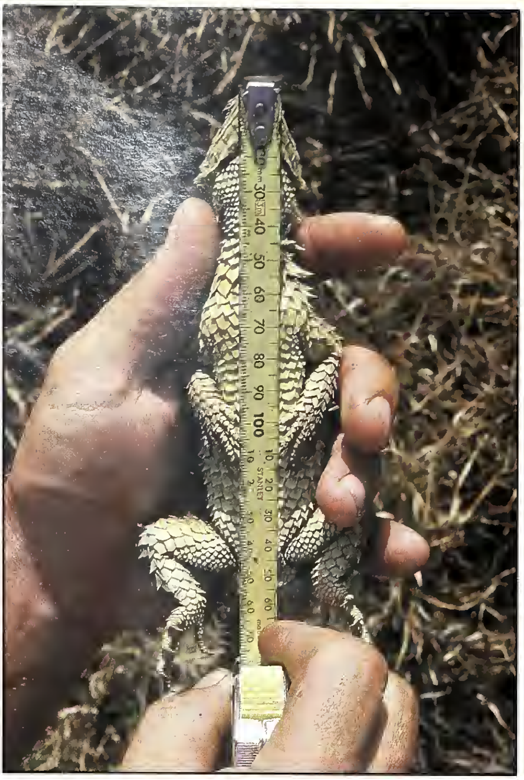
The males have enlarged glandular scales on the inside of the upper forelimbs. These are easily visible and are noticeable even in subadult animals. Although both sexes have femoral pores, those on the males are more developed and bordered by extensive patches of glandular femoral scales.

The sungazer is endemic in the grassland of the North-eastern Orange Free State, the western part of Natal and the South-eastern Transvaal. The distribution is not known to have changed significantly during historical times. Although these three provincial populations are disjunct, it is probably because of natural barriers, and not a man-induced phenomenon. In the Transvaal the species inhabits an area of approximately 1 790 km^2 between the Vaal and the Klip Rivers. The Vaal River forms the northern boundary, with the Klip River south of Standerton and the Versamelberg the boundary in the south. In the east the escarpment at Charlestown forms a natural barrier.

JANET MATTHEWS

A natural burrow. Note the flattened oval-shaped entrance

The lizards live in colonies of self-excavated burrows in gently sloping or flat grassland. The burrows are dug in silty fine sand to an average depth of some 420 mm below the soil surface and average 1 800 mm in length. To date no burrows have yet been found in the black turf. The distribution of *Cordylus giganteus* in the Transvaal is limited to three veld types, namely Acocks 52, 53 and 54. All of these represent *Themeda triandra* grassland or transitional zones thereof. The majority of the lizards occur in veld type 52, of which 79% is already degraded.


JANET MATTHEWS

Each lizard was weighed and measured

The survival of the species is threatened by several factors, all related to man. A traditional threat is the use of these lizards by witchdoctors for medicinal purposes. Witchdoctors pay local Africans as much as R10,00 for each lizard. A Zulu belief is that, as the sungazer never wanders far from its burrow, medicine made from the lizard will induce wayward women to stay at home. Despite the lizard being highly protected by law, many skins are to be seen in *muti* shops. Sungazers are also extremely popular in the pet trade and in certain European countries they are sold for as much as R150,00 each.

It has become obvious, though, that the main threat to this endemic lizard is habitat destruction. The grass-

RICHARD NEWBERY

The typical pose of basking sungazers from whence their name land in which it makes its home is extensively used for the cultivation of cash crops, particularly maize and sunflowers. Large areas of land have thus been ploughed and this has, without a doubt, affected their numbers.

A new and more serious threat can be ascribed to the fact that the three veld types are to a large extent underlain by coal beds. These are now to be exploited to produce electricity and at present a large power station is under construction near Amersfoort. The Majuba Power Station site is in an area where one of the densest concentrations of these lizards in the Transvaal is to be found. The effect of this power station will be felt over an area of 32 km^2 or 1,79% of the lizards' total distribution range in the Transvaal. A thorough survey has shown that more than 3 000 lizards, of which at least 2 000 will be directly affected, occur in this area. This excludes the numbers affected by the feeder mines, conveyor belts, roads, railways and dams.

The problem of ensuring this population's survival was tackled by the Transvaal Nature Conservation Division's Herpetological Subsection, with assistance from ESCOM's Environmental Impact Control Group.

The most obvious solution was to relocate all the affected individuals to a safer area. As this had never been attempted before it was decided, as a pilot project, to relocate two colonies and monitor the outcome. Two isolated colonies were chosen, enabling them to be moved as complete units. This ensured that the colony structure remained intact. Accurate survey maps were drawn and sex ratios, distance between burrows, burrow measurements and aspects were recorded.

The first colony of 22 burrows, one of which was unoccupied, was excavated on February 22, 1983. Altogether 35 animals were found, consisting of 13 adult females, eight adult males, six immatures and eight juveniles. Two females were found with three juveniles each and one female with two.

The second colony of nine burrows was excavated on March 25, 1983. All were occupied and a total of 12 animals was found. This colony consisted of six females, four males and two juveniles who were found together with an adult female.

With the assistance of Errol and Michelle Pietersen two suitable relocation sites were selected on the farm Rietpoort. These sites had the same soil type, a similar grass cover and were reasonably close to existing *Cordylus giganteus* colonies. New burrows were excavated at these sites using 100 mm diameter soil augers for the first colony and 65 mm diameter soil augers for the second. The mean distance between natural burrows was taken into account and the new holes were dug in evenly spaced rows in order to simplify and aid the monitoring process. Each adult lizard was marked with a distinctive coloured ribbon and then released at the new site. Juveniles and immatures were not marked because of the possibility of the ribbon around the neck causing constriction at a later stage due to growth of the individual. Where an adult and juvenile or immature were found in the same burrow, they were kept and released together at the same burrow at the

G. BATCHELOR

Intensive utilization of its habitat is a threat to this endemic lizard

JANET MATTHEWS

Digging a new home for a relocated sungazer

RICHARD NEWBERY

Due to co-operation the excavation and relocation of the lizards remained ahead of development

new site. Their initial reactions were then monitored and recorded.

During the following months the two colonies were visited several times to record any changes and movements. The results exceeded all expectations. At the first colony it was found that 77,14% of the lizards had remained in the relocation site after 3 months, while at the second colony a success rate of 72,72% was obtained. Shortly after the first rains these remaining lizards started deepening their burrows, a very encouraging sign. An important factor contributing to the success was that the lizards had been relocated in an area where a natural colony already existed. This ensured the suitability of the site, and also allowed the relocated lizards to move into deserted natural burrows. Food did not appear to be a very important factor as far as the relocation was concerned, as the sungazer is to a large extent opportunistic in its feeding habits. Stomachs of previously collected specimens contained weevils, ants, dung beetles, termites, grasshoppers, moths, millipedes, blister beetles, stink bugs and spiders.

The success of the relocation trials has provided a solution to the Majuba lizard problem. However, the availability and choice of suitable relocation sites remains a problem. As mentioned previously, most of the area is degraded, leaving only small scattered patches of natural veld. Great care will have to be taken to ensure that when relocation takes place the carrying capacity of the habitat is not exceeded. Fortunately, certain farmers in the vicinity have voluntarily offered sections of their land as relocation sites. Certain organisations have volunteered assistance with the relocation program. These include the Vaal Triangle and the Volksrust branches of the Wildlife Society of South Africa, as well as the Transvaal Herpetological Association.

Due to the wholehearted co-operation of ESCOM's Environmental Impact Control Section the relocation program could be planned to the last detail. Construction of housing for black workers at the power station site has recently begun. All the lizards affected by this construction could, however, be removed thanks to the willing co-operation of the contractor's foreman. Although the construction of housing for other employees has not yet begun there is a great deal of activity in the area as land surveyors, engineers and construction teams arrive. Due to the harsh climatic conditions of the Highveld, great care had to be taken to move as few lizards as possible during the winter, as they are very susceptible to stress at this time of the year. To ensure that the disturbance of the lizards is minimised until such time as they can be relocated, each burrow has been marked with a red stake. Posters have been printed and placed at strategic points in the area, explaining the significance of the red markers in four different languages and at the same time warning people that unnecessary disturbance of the lizards could lead to prosecution.

According to ESCOM sources the construction of one power station per year over the next 10 years is being planned. Some of these will no doubt be sited in areas where *Cordylus giganteus* occur. It is therefore obvious that the range of this endemic lizard will continue to decline. To ensure that it continues to form an integral part of the fauna of the south-eastern part of the Highveld, the importance of establishing a reserve for this species cannot be over-emphasised. Possible sites are currently being investigated by the Division.

Spotted killifish

Lowveld largemouth

The Future of Rare Fish Species in the Transvaal

C.J. KLEYNHANS

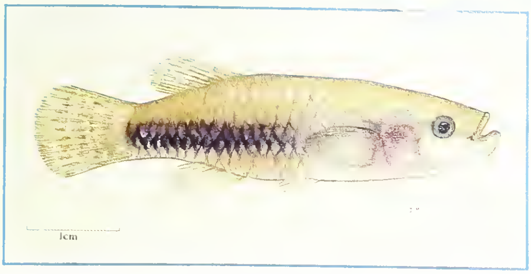
APPROXIMATELY 68 different indigenous fresh water fish species occur in Transvaal river systems, far fewer than the number of mammal, bird and plan species found in the province. The relatively low variety would, therefore, suggest that particular attention should be paid to the conservation of a number of species.

Eight Transvaal fish species are listed in the South African Red Data Book for fish, drawn up by Skelton in 1977. These are the southern kneria *Kneria auriculata*, Treur River barb *Barbus treurensis*, Incomati rock catlet *Chiloglanis bifurcus*, Pongola rock catlet *Chilpglanis emarginatus,* Lowveld largemouth *Serranochromis meridianus*, Lomati largemouth *Astatotilapia brevis* and two species of killifish *Nothobranchius orthonotus* and *N. rachovii*. To determine the conservation status of some of these and a few other fish species in the Transvaal, the Nature Conservation Division initiated a survey in 1977 which was continued up to 1982.

The purpose of this investigation was mainly to examine the status and distribution of possibly rare fish species and to identify limiting and threatening factors. At the same time attention was also given to the general ecology of the species concerned. The species covered during the survey were, to a large extent, selected arbitrarily on the basis of distribution surveys conducted during the sixties. Some of the species are plentiful elsewhere in Africa, but as it is important to retain the entire Transvaal spectrum, they were also included in the survey, which ultimately covered eleven fish species.

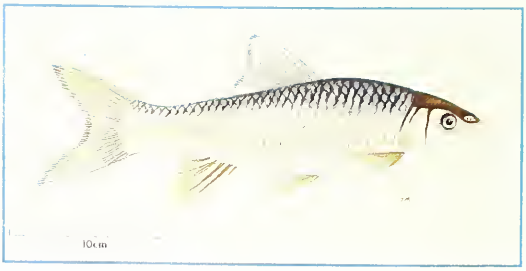
The first to be considered was the southern kneria *Kneria auriculata*. Five populations occur in small tributaries of the Crocodile River in the Eastern Transvaal. Then there is a gap of several hundred kilometres in the distribution before it is again found in Zimbabwe. Apparently the kneria reached the Transvaal during the Pleistocene Epoch (one to two million years ago) by river capture from the north. The present distribution, restricted to small tributaries of the Crocodile River, is due to natural factors. *Kneria auriculata* shows a preference for quiet pools in small slowly flowing streams and is not found in the larger swiftly flowing Crocodile River. During the Pleistocene Epoch, alternating pluvial and interpluvial periods occurred, during which the rainfall was respectively much higher and then again much lower than the present average. *Kneria auriculata* must have entered the Crocodile River during an interpluvial period when the average level of the river was low. During pluvial periods the Crocodile River would have flowed strongly and the species would have become isolated in the small tributaries in which it had earlier established itself.

Rainbow trout have apparently played a rôle in reducing the distribution of *Kneria auriculata*. If one takes into account, however, that trout have occurred in certain streams for 30 years or longer and have still not exterminated the local kneria population, trout alone



Striped topminnow

ARTWORK: JEANNIE MENTZ



Incomati chiselmouth

cannot be regarded as a serious threat. Trout prefer the colder swiftly flowing sections while kneria are found further downstream in the slower sections. However, in cases where so-called stream improvements have been carried out by the construction of weirs to create trout habitat, trout may eventually lead to the local disappearance of the kneria.

The construction of the Braam Raubenheimer Dam in the Crocodile River will result in a large part of the habitat of one kneria population being inundated. Although representatives of the population concerned will continue to survive in a few small tributaries, 300 kneria were transferred as a precautionary measure to a suitable tributary of the nearby Elands River in 1981. During the first follow-up investigation early in 1982 no kneria were found and it was assumed that the translocation had been unsuccessful. In July 1982 the survey was repeated and this time it was found that kneria were, in fact, well established in the stream. The little fish had bred very well and had spread over a distance of some 2 km.

As a whole *Kneria auriculata* is a rare, potentially vulnerable species. However, the fact that it can be resettled successfully means that it will not easily become extinct. On the other hand the presence of this species in an area of intensive agriculture may make it difficult to secure the future of all five populations.

The rare endemic Treur River barb *Barbus treurensis* is apparently extinct in its type locality as a result of the establishment of smallmouth bass and trout. At present it is found only in a stretch of the Blyde River above a waterfall which acts as a barrier to trout. The habitat is of high quality and this species is plentiful within these limits of approximately 4,5 km of river. As the normal distribution range is situated within a proclaimed trout angling area, it is potentially vulnerable. In the past there was a request by the landowner to stock this stretch of river with trout. This request was naturally refused, but it is an example of the dangers to which this fish may be exposed in future. It is essential that the habitat be protected against physical disturbance and the release of any alien fish species in this part of the Blyde River must be prevented at all costs. It would also be desirable if a second population could be established in suitable habitat in a different locality.

Both the Incomati chiselmouth *Varicorhinus nelspruitensis* and the pennant-tail catlet *Chiloglanis anoterus* are endemic in the Incomati and Pongola systems. These two species, as well as the Natal mountain catfish *Amphiluis natalensis*, have specialised habitat preferences but cannot be regarded as rare. All three occur to some extent in trout streams but are plentiful even here as they seldom fall prey to trout, owing to their habits. A specific locality where they should be conserved together is the Shiyalongubo River, one of the headwaters of the Lomati River. The presence of the three species in this stream is an example of a fish population which has become isolated by river capture. This supposition is confirmed by geomorphological evidence.

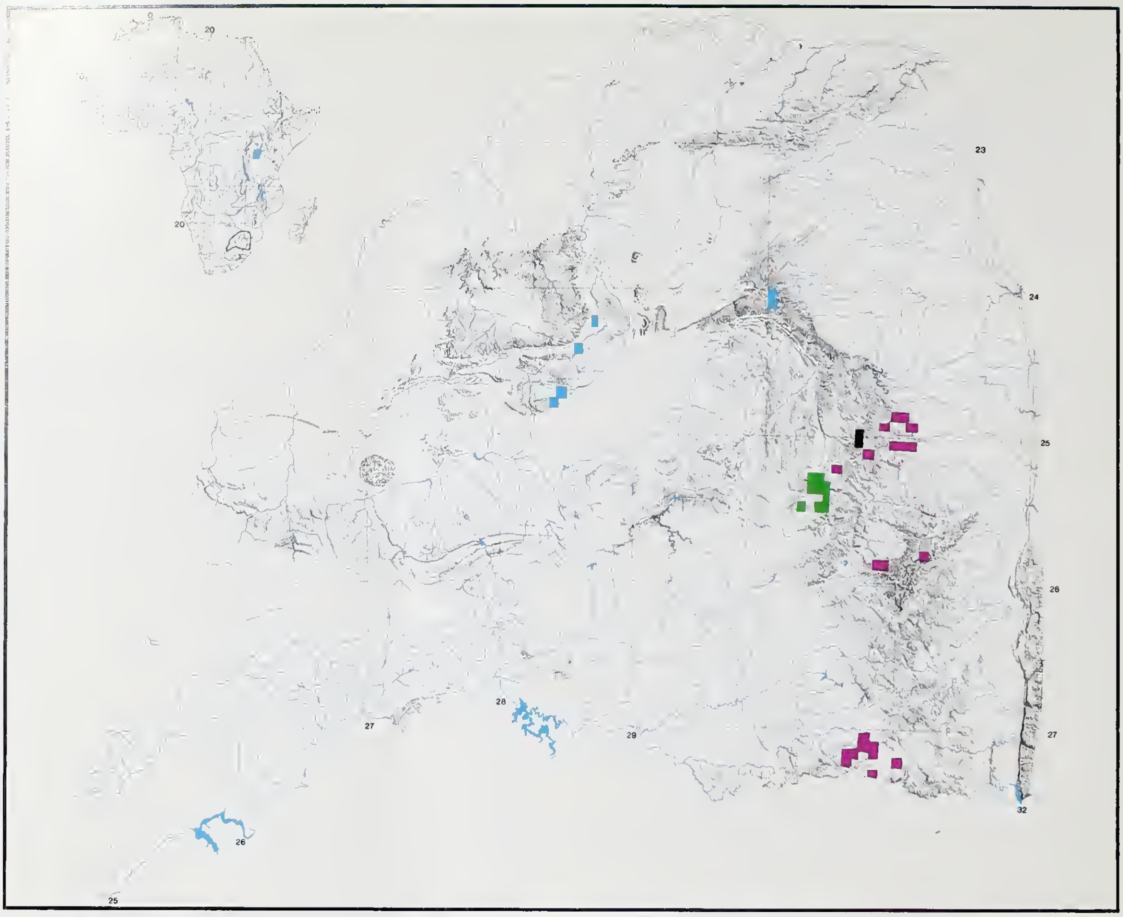
The Incomati rock catlet *Chiloglanis bifurcus* and the Pongola rock catlet *Chiloglanis emarginatus* are both species found in rapids and consequently have a limited distribution and low population density. *Chiloglanis bifurcus* is endemic in the Crocodile River in the Eastern Transvaal. It is rare and potentially vulnerable, while *Chiloglanis emarginatus*, which is found in the Pongola and Incomati systems and in Zimbabwe, is rare. Habitat destruction, such as the building of dams and an increase in the level of water pollution, is the most important factor which may have an adverse effect on the future of the two species.

Before the latest survey the striped topminnow *Aplocheilichthys katangae* was known from only one stream in the Transvaal. It has since been found in another three streams but is rare in the Transvaal and will probably be included in the revised Red Data Book. The use of pesticides is a threat which can seriously affect the striped topminnow and Johnston's topminnow *Aplocheilichthys johnstonii*. Both species feed on insects near the surface and the use of insecticides to combat mosquitoes can spell great danger to their survival. However, Johnston's topminnow is relatively widespread and plentiful in the Transvaal.

The Lowveld largemouth *Serranochromis meridianus* is found especially in the Sabie River in the Kruger National Park. It also occurs in the Sand River, where it represents about 1% of the total fish population. Although it has become well established in man-made dams in the Kruger National Park, its habitat is being threatened by silting due to poor or non-existent soil conservation practices upstream beyond the boundary of the Park. It must, therefore, be regarded as potentially vulnerable in its natural habitat.

The Lomati largemouth *Astatotilapia brevis* is found only in the Lomati and Komati Rivers in the Lowveld. This species, like the Lowveld largemouth, prefers large, quiet pools. The building of dams, especially in the Lomati River, has contributed to a considerable

ARTWORK: JOHN M. ANDERSON



■ *Barbus treurensis*
🟩 *Kneria auriculata*
🟪 *Varicorhinus nelspruitensis*
🟦 *Aplocheilichthys katangae*

The distribution of four rare fish species in Transvaal. Each square represents a sixteenth-degree square unit

expansion of suitable habitat for this species. Consequently it occurs in relatively large numbers within its restricted distribution range. It is also found in dams in the Kruger National Park where it has adapted well. *Astatotilapia brevis* is thus a rare species which may, in future, be harmed by pesticides used in crop cultivation.

In total, seven species are thus proposed for inclusion in the revised Red Data Book for fish in South Africa: *Kneria auriculata*, *Barbus treurensis*. *Chiloglanis bifurcus*, *Chiloglanis emarginatus*, *Aplocheilichthys katangae*, *Serranochromis meridianus* and *Astatotilapia brevis*. The Kruger National Park was, however, not included in this investigation. Should the fish species of this area also be taken into account, the two killifish species *Nothobranchius orthonotus* and *N. rachovii* would also be included, while the lungfish *Protopterus annectens* should also be considered. In 1981 the snake catfish *Clarias theodorae* was discovered in the Transvaal and this species will presumably also be included in the new Red Data Book.

As 50 of the Transvaal's approximately 68 fish species occur in the Kruger National Park, one is inclined to assume that the great majority of these enjoy adequate protection. It is unfortunately not the case, as the rivers of the Park are directly affected by various types of disturbance upstream outside the borders. It is thus clear that trying to preserve a rare fish species by creating a special nature reserve is seldom a practical solution. The only solution is to strive for the conservation of the aquatic ecosystems and river systems by protecting them against disturbance such as pollution, misuse and the establishment of alien species. Continual monitoring programmes on rare species and even the more common species are therefore essential. It would also be wise not only to attend to the conservation of individual fish species but also to conserve their natural distribution ranges as far as possible, as it is a natural phenomenon representing geomorphological and climatic changes over millions of years.

The indisputable fact that the success of nature conservation is largely dependent on the attitude and convictions of landowners thus applies to our indigenous fish species as well. ♦

DAVID MICHAEL SKEAD

It was with shock and disbelief that I learnt of the tragic death of David Skead in a light aircraft accident on Sunday 16 October 1983. The accident brought to a premature end his career in nature conservation, which started in 1956 when he joined the Natal Parks Board as a Learner Ranger. Nature conservation, as a recognised profession, was still in its infancy at the time and David was able to be part of its growth and development.

He joined our Division in July 1964 as a Senior Technical Assistant and progressed through various technical and professional ranks to the post of Chief Professional Officer in charge of the Bird Subsection. During this period he also obtained both an M.Sc. and a D.Sc. degree for his ornithological research carried out at Barberspan Research Station and achieved international recognition for his work on waterfowl.

I knew David as a colleague for eleven years and, from early 1981, was privileged to have him as a member of my team. He put all he had into his work and continuously strove for perfection. The characteristics that I most appreciated were his enthusiasm, his reliability and his support. This support was not blindly given, but only after he had satisfied himself that a particular course of action was worth supporting.

David's career in nature conservation spanned nearly thirty years and his total dedication to conservation was an inspiration to all who knew and worked with him. He is sorely missed.

R. Parris

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Front cover: A young roan antelope cow *Hippotragus equinus* on Percy Fyfe Nature Reserve. Thanks to the efforts of the Transvaal Nature Conservation Division and a number of landowners, this species has shown a remarkable recovery in Transvaal during the past sixteen years. Photographed by Peter Barichievy.

Back cover: A suburban spotted eagle owlet. This bird was hatched and reared in half a barrel, placed in a tree specifically as an artificial nest for owls. Photographed in Garsfontein, Pretoria by René Breytenbach.

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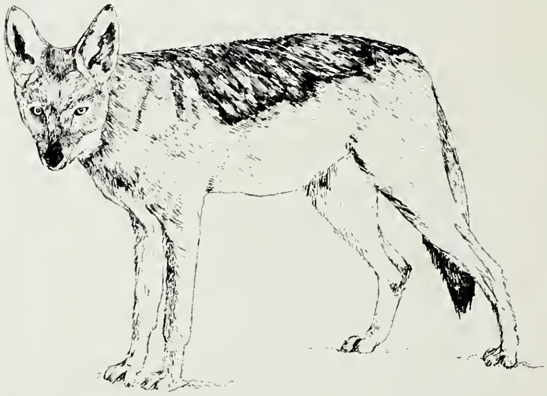
ARTWORK: JEANNIE MENTZ

Poison . . .

> Decision-makers live in the cruel world of realpolitic. It is a world where policy is based not on ideals but on power, and where choice is limited not by what is possible, but that is practicable. Conservationists should remember this — too often they address themselves only to matters of detail, as if they suffered from political agoraphobia, and too often, where they venture into the wide open spaces of policy making, they retreat to rhetoric, taking insufficient note of the many pressures (provincial, national and international) governments have to take for granted.
>
> *IUCN Viewpoint*
> March 1975

THE black-backed jackal is a master problem animal, public enemy number one in the eyes of the stock farmer. It kills lambs on the Highveld and attacks calving cows in the Bushveld; in the Soutpansberg it is the carrier of rabies.

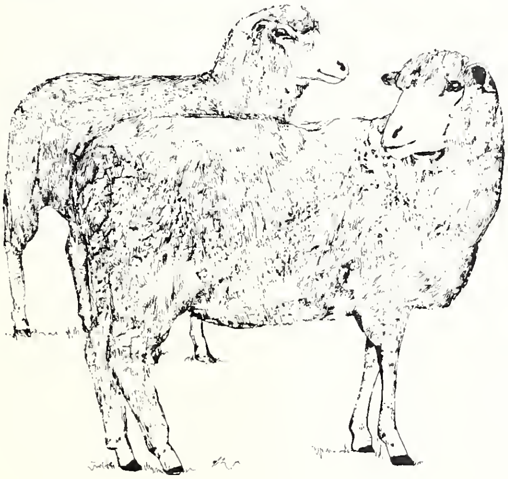


What can be done about it? For the stock farmer there is only one solution: "Kill the lot!" It is of little use explaining the jackal's role in nature to a farmer, or suggesting sophisticated control methods. He requires a simple and direct solution to the problem.

This solution usually amounts to the use of poison, and more specifically strychnine. There are alterna-

and Nature Conservation

tives. On the Highveld, problem animal control clubs use foxhounds and coyote getters with considerable success. The requirement is that the control programme be well organized and everyone concerned pull together. Both methods have the advantage that they are reasonably selective in killing jackals. On the other hand, in the case of strychnine there is usually minimal control over which animals are killed. Nevertheless, any farmer can take certain precautions to limit the mortality among innocent non-target species.



The concern of conservationists about the injudicious or irresponsible use of poison is well justified. However, to condemn all farmers summarily for using poison would not contribute one iota to solving the problem. A farmer put it this way: "Those people making such a fuss do not have land or jackals." Which boils down to the fact that the landowner holds the key. I would rather negotiate with a key person and try to influence him, than have a head-on confrontation with him.

The Transvaal Nature Conservation Division has a commitment towards wildlife as well as the farming community. Its policy is determined by the following realities:

- In terms of the Nature Conservation Ordinance, the Division is responsible for aiding the farming community in the control of problem animals.
- Other than the use of poison, virtually no acceptable method of jackal control is currently available outside the problem animal control clubs' proclaimed hunting areas.
- The use of poison is an old and established practice which is used by the majority of stock farmers in the control of problem animals.

The Division has sympathy for those farmers suffering loss from problem animals and is more than willing to assist them in the control, using the best and most effective means available. Preference is given to compounds and techniques that are both humane and selective. In the case of strychnine or similar poisons, the poisoning of a whole carcass can have dramatic and possibly irreversible ecological consequences, while techniques for using strychnine with minimal effect on non-target species exist.

It is only human to turn to legislation in such a case. Pressure is being exerted on the Division to make the use of poison subject to a permit. I predict that most farmers will ignore such measures. In any case, on what grounds can an officer refuse a permit, should a farmer decide to apply for one?

The answer lies in teaching those farmers who do not yet know how to use poison selectively, how it should be done. No farmer will destroy harmless animals if he knows how to avoid it.

S.S. du P

Animals in Transvaal Rock Paintings

Bert Woodhouse

ROCK art is a challenging and interesting art form. Not only does it have its own intrinsic value, but, as it usually depicts both animals and human figures, it provides a record of considerable zoological and anthropological value. "Rock art" refers to both paintings and engravings. While paintings are found under rock overhangs or in shallow caves, engravings are generally encountered on rocks lying on open ground. This article deals with only one aspect of rock art, but one that should be of special interest to readers of this publication: animals in rock paintings. In a future article, animals in rock engravings will be dealt with.

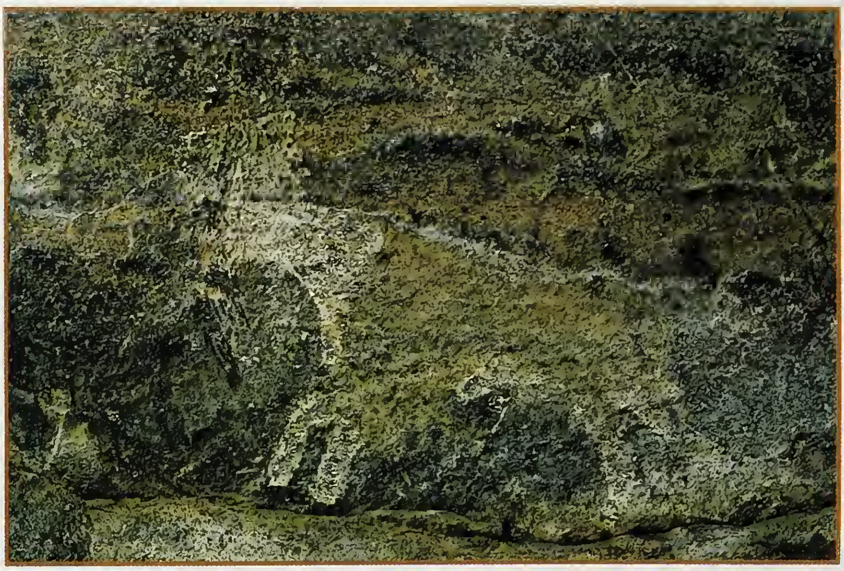

BERT WOODHOUSE

Figure 1

Information on the distribution of rock paintings in the Transvaal has been recorded for many years by professional archaeologists, amateur enthusiasts, artists and nature conservationists. The first publication on the Transvaal's rock art was that of the Reverend Noel Roberts, which appeared in *South African Journal of Science* in 1916, in which he drew attention to the Bushman paintings and the later paintings by Bantu-speaking people in the Makgabeng Mountains.

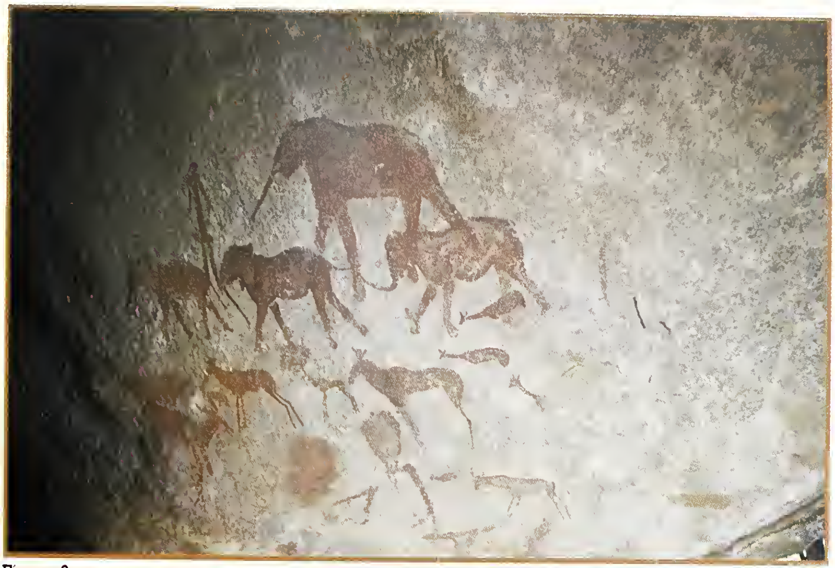
Many rock painting sites were recorded by Professor van Riet Lowe on the basis of a circular sent to police stations and magistrates' offices, as well as additional information from a variety of other sources. His 1952 publication lists 100 sites, but this is probably a comparatively small percentage of those still waiting to be found in areas such as the Waterberg, the Soutpansberg and the Limpopo valley.

Professor Walter Battiss spent a great deal of time visiting and copying paintings at a number of sites. It is known from his book *The Artists of the Rocks*, published in 1948, that he received co-operation from Dr. K.H. Lephene. Hopefully this article may stimulate some reader to supply more information about Dr. Lephene's work and records.

Professor Murray Schoonraad, now with the University of Natal, grew up in Messina and often accompanied Battiss on his field trips. His *Preliminary Survey of Rock Art in the Limpopo Valley*, published in *South African Archaeological Bulletin* in 1960, was a major contribution to the subject.

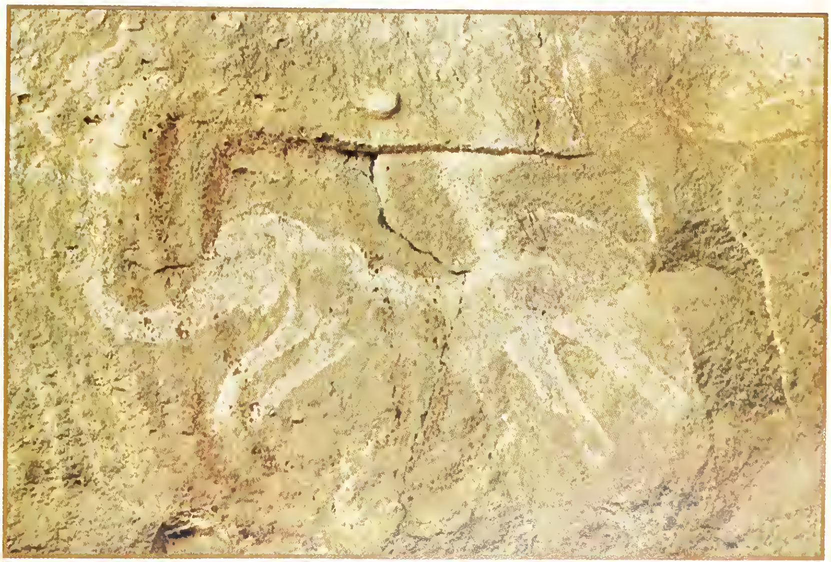
Professor Revil Mason dealt with Bushman paintings in *Prehistory of the Transvaal* and reproduced two exquisite antelope studies from the Makgabeng, traced by Jean Humphries and painted by Patricia Vinnicombe. In an article in *Lantern* in 1958, he dealt in some detail with the unusual paintings at Haakdoorndraai.

Mention is made of paintings along the Palala River and in the Soutpansberg in *The Hunter and his Art* by the husband and wife team of Jalmar and Ione Rudner. Another team, Adrian and Joan Boshier, spent much time making copies in the Makgabeng, contributing several articles to newspapers and magazines.



BERT WOODHOUSE

Figure 2



BERT WOODHOUSE

Figure 3

Harold Pager, well known for his work in the Natal Drakensberg, spent a period in the Limpopo Valley studying some enigmatic paintings which he later identified as fish traps. The results were published in *South African Journal of Science* in 1975. His 1973 article in *South African Archaeological Bulletin* is a valuable contribution to the study of rock paintings of animals.

In the Kruger National Park, staff member Mike English is systematically recording sites in the Malelane area and has contributed several articles to *Custos*. In conjunction with D.N. Lee I have carried out a survey of sites in the Lapalala Wilderness Area at the request of Clive Walker, while Ansie Batchelor, working on an Human Sciences Research Council grant, is busy compiling a report on the paintings of the Eastern Transvaal.

Lack of space precludes further discussion on precious or present work and publications. A list of supporting references can be made available to the reader on request.

No infallible method for dating a rock painting has yet been developed. Archaeologists always hope to find some charcoal that can be accurately dated in the same layer of cave litter as part of a painting which has broken or flaked off the rock-face, but such coincidences rarely occur. Transvaal rock paintings range in age from several hundred to several thousand years and span the Later Stone Age, which lasted some 10 000 to 20 000 years, and the Iron Age, which was comtemporary with it for 1 000 years or so prior to the arrival of the first White settlers. In general, we can think of the Later Stone Age people as Bushmen, and their way of life and art continued for several hundred years after the arrival of the Transvaal Iron Age people — the Bantu-speaking people.

The pigments used in the paintings have been found in a number of excavations by, among others, Professor Revil Mason of the University of the Witwatersrand. They consist of haematite (iron oxide, red ochre) for the red, limonite (yellow ochre) for the yellow and manganese oxide for the black. Zinc oxide was sometimes used for the white but in other cases it was probably a less durable substance, such as kaolin, which does not wear well and has disappeared in the more exposed paintings. From paintings of artists working in other parts of the country we know that they applied the paint with the pointed end of a feather, sharpened in the manner of a quill pen. They also made brushes from the white tail hair of the black wildebeest in those areas where this species was found.

ELAND

In the Natal Drakensberg rock paintings, the eland is the most frequent animal and there is little doubt that it occupied a special place in the economy, cultural life and thoughts of the people. It had great symbolic significance, apparently being the symbol of everything good. It occurs much less frequently in the Transvaal rock paintings where it is not painted in such large herds, appearing only as isolated examples at a number of sites. Harold Pager noted that it is sometimes shaded, using a technique more usually associated with the Natal Drakensberg. The one illustrated in figure 1 does not aspire to that level of sophistication, but is interesting on account of the red "blood" on the head, having probably been wounded by a hunter.

ELEPHANT

From the point of general artistic merit and interest, one of the finest rock paintings in the Transvaal yet discovered is that of a herd of elephant (figure 2), found between Nelspruit and White River. It was first published by Walter Battiss. The herd, accompanied by a number of other animals which include hartebeest and impala, is painted in a situation where it appears to be moving steadily forward into a cleft between huge boulders. It is a major masterpiece, created with deliberate overlapping of certain of the animals to create a well-integrated composition.

There are several elephant painted in white at the Haakdoorndraai site. One, reproduced in figure 3, gives an impression of rapid movement, which some Bushmen artists had a particular skill in portraying.

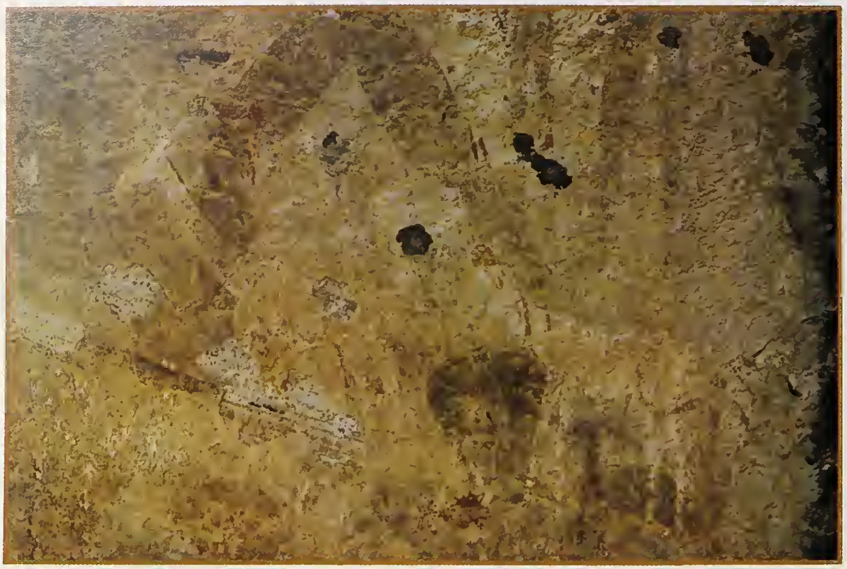

BERT WOODHOUSE

Figure 4

GIRAFFE

Many fine giraffe paintings are to be found at sites north of the Limpopo, in Zimbabwe. They are less common south of the river, but there are several good examples at certain sites, the article by Rev. Roberts recording a fine example. Although somewhat faded, the one from the Potgietersrus area reproduced in figure 4 demonstrates a skill and sensitivity which reflect the artist's observation and regard for his subject. The giraffe may well have had a similar symbolic significance in this area to that of the eland in the Natal Drakensberg.

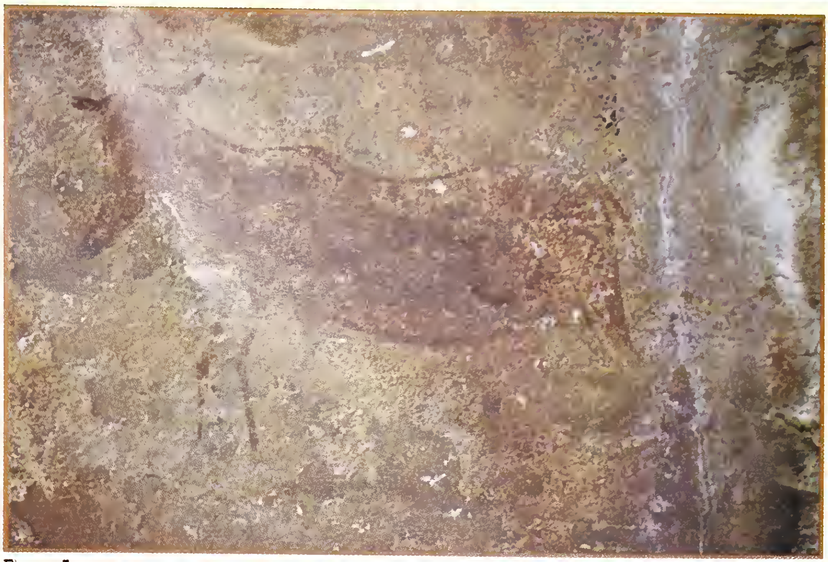


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Figure 5

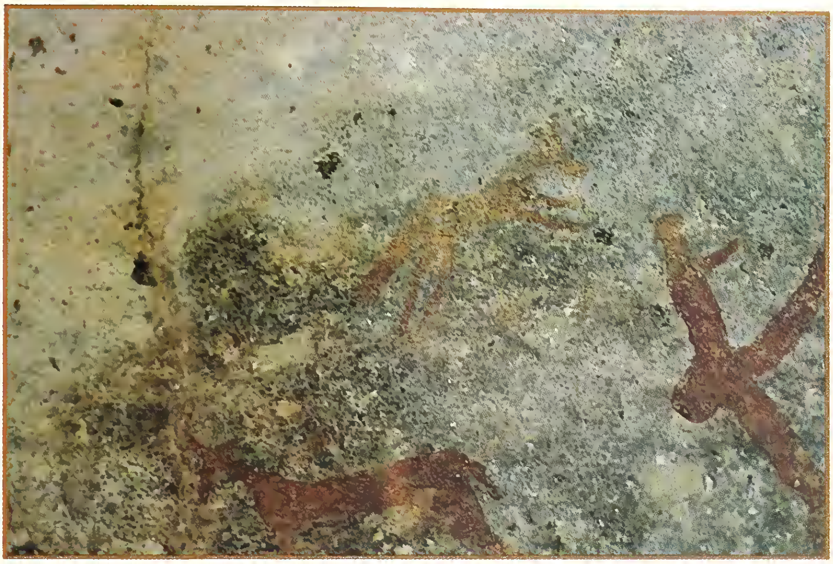

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Figure 6

HARTEBEEST

To distinguish the difference between red hartebeest, tsessebe and blesbok in rock paintings requires a zoologist rather than a rock painting enthusiast, but I take the species in figure 5, with its head turned slightly away from the viewer, to be one of that group. I am inclined to favour the tsesebe, on the basis that this painting was found in the well-wooded Potgietersrus district.

IMPALA

Impala are depicted with the herd of elephant mentioned earlier and at several of the sites recorded by Mike English in the Kruger National Park. I have yet to find the masterpiece study of a herd of impala ewes with the ever-watchful ram which, hopefully, remains to be discovered in some remote corner of the Transvaal.

JACKAL

Bushman folklore emphasises the jackal's cunning and his ability to outwit even the lion. His cheekiness is reflected in the picture from Lapalala (figure 6). Paintings of jackal are not common and where they occur elsewhere in the country they are usually associated with paintings of lion kills. This one is associated with two human figures and the line of kudu mentioned below, possibly symbolising an impending kill by hunters.

KUDU

The ears, to me, are the give-away of any kudu painting. The line of cows with calves from the Lower Umdoni shelter in the Lapalala Wilderness Area (figure 7) is a delight. As can be seen, they are

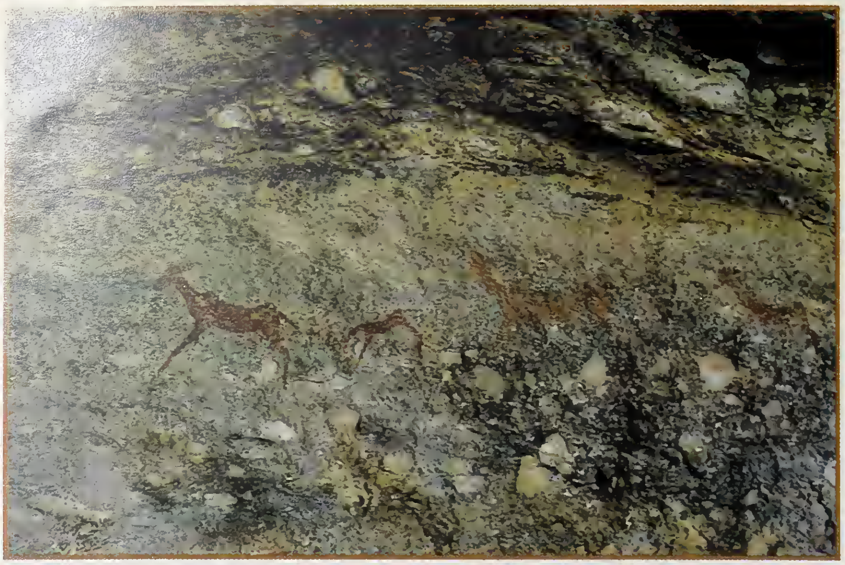
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Figure 7

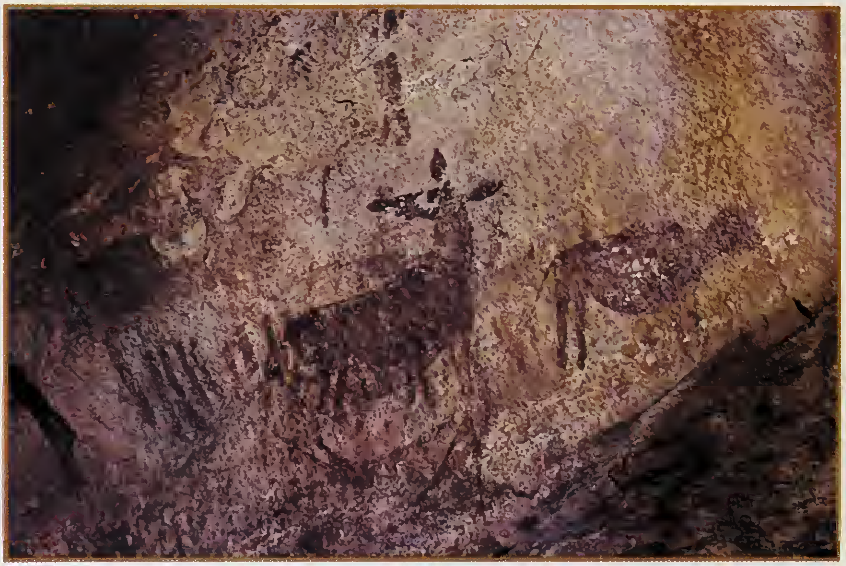
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Figure 8

painted on a rough rock-face but strut imperturbably out of the past and into the future.

At least one artist was fascinated by the problem of painting the turning of heads. He exercised his skill at a number of sites in the Waterberg (figures 8 and 9). Of comparable standard is the head of a kudu bull with magnificent horns at the Mukwa shelter, Lapalala (figure 10).

LEOPARD

I have not yet had the opportunity to photograph a painting of a leopard in the Transvaal, as they are rare in Southern Africa. However, since Rev. Roberts reproduced one in his article, a visit to the Makgabeng may possibly be productive.

MONKEYS

Mike English, in pursuit of his self-imposed task of recording rock paintings in the Kruger National Park, discovered this painting (figure 11). The photograph, taken with his kind co-operation, is part of the scene. Note the long tails which, taking into account the area in which the painting was found, probably indicate the vervet monkey. At present I know of no other paintings of monkeys.

OSTRICH

It is known that the Bushmen sometimes disguised themselves as ostriches to approach close enough to their quarry to get in a shot with their comparatively small bows. The reason for choosing an ostrich disguise only recently occurred to me. The ostrich is the only large two-legged creature on the veld, apart from man himself, and it associates freely with a variety of desirable game animals. This painting (figure 12) is undoubtedly an ostrich rather than a Bushman in disguise.

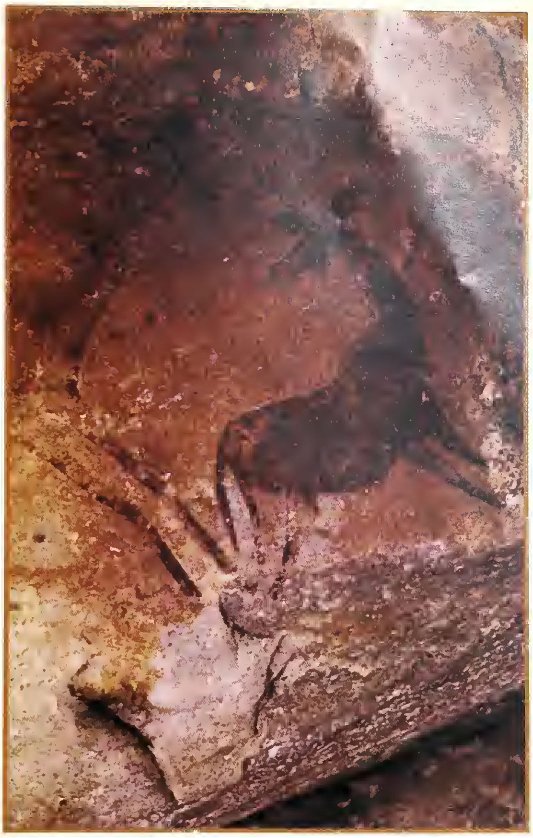

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Figure 9

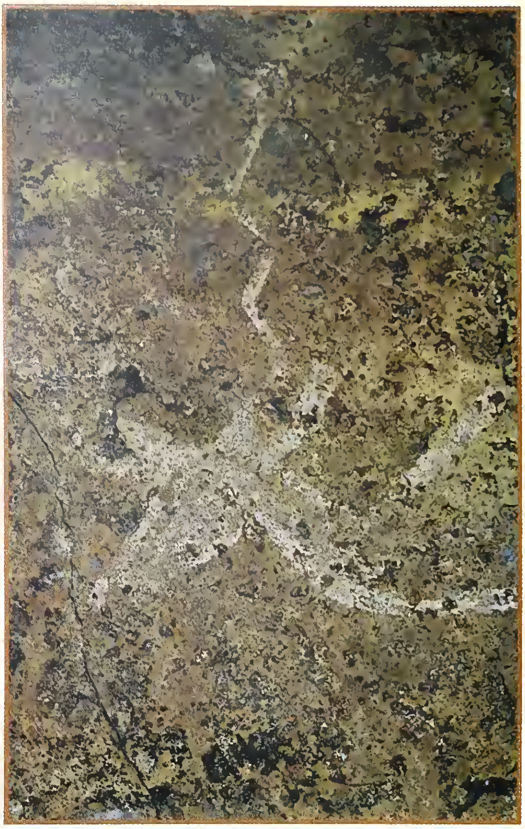

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Figure 10

ROAN ANTELOPE

Immediately below the ostrich in the same frieze (figure 12) is a beautiful roan antelope head. A little nick in the rock face has been utilised as an eye. The pigment in which the roan is painted has a mauve colour which is unique in my experience. A deposit of the friable raw material was found in the immediate vicinity.

WILDEBEEST

The identity of this painting at Haakdoorndraai (figure 13) must have been overlooked by many visitors, and even by experienced rock art enthusiasts. It takes a little time to realise that it represents a herd of wildebeest standing close together next to a tree, in a composition that would do credit to Gordon Vorster. Note the horns at the top and the spindly

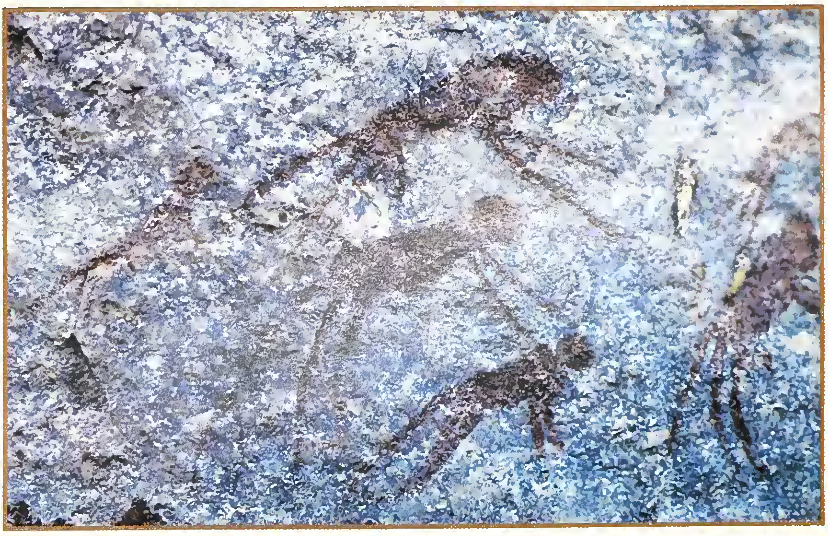

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Figure 11

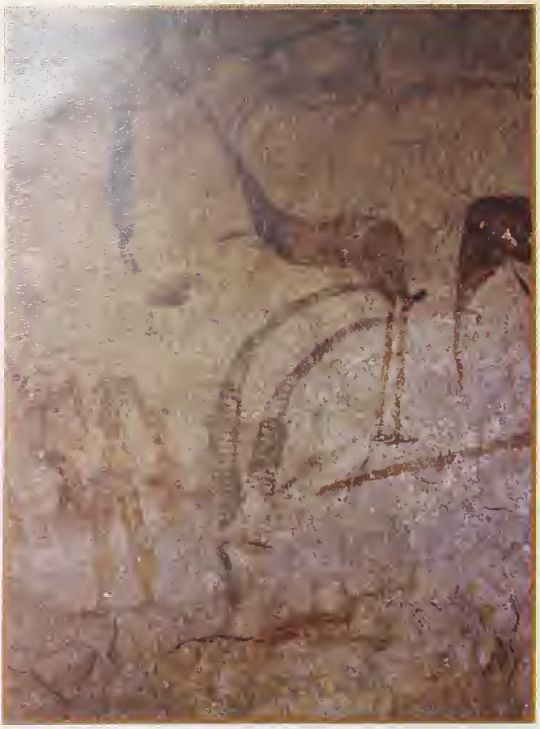
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Figure 12

legs at the bottom. It is the sort of delight that rewards many hours of peering at rockfaces and it is a reminder that there may always be a masterpiece just around the corner. Paintings of trees are uncommon in South Africa, but common in Zimbabwe.

CONSERVATION OF ROCK PAINTINGS

South African rock art is as detailed, well painted and varied as that which is found anywhere else in the world. It is thus a priceless cultural heritage, well worthy of preservation for the enjoyment of generations to come.

A number of factors, some natural and some man-made, lead to the deterioration of rock paintings. We have to accept the fact that, against the geological time-scale, they are but transient — weathering and fading due to natural causes. This natural process can be accelerated greatly by human intervention and it is therefore imperative that no painting should be touched or interfered with in any way. Building a fire in a rock shelter with rock paintings can soot-blacken the walls, causing deterioration or destruction of an irreplacable work of art. Deliberate destruction and vandalism are serious problems at certain sites and, for this reason, the National Monuments Act affords all rock art leval protection. Offences are punishable by a fine of up to R5 000 or one year's imprisonment or both.

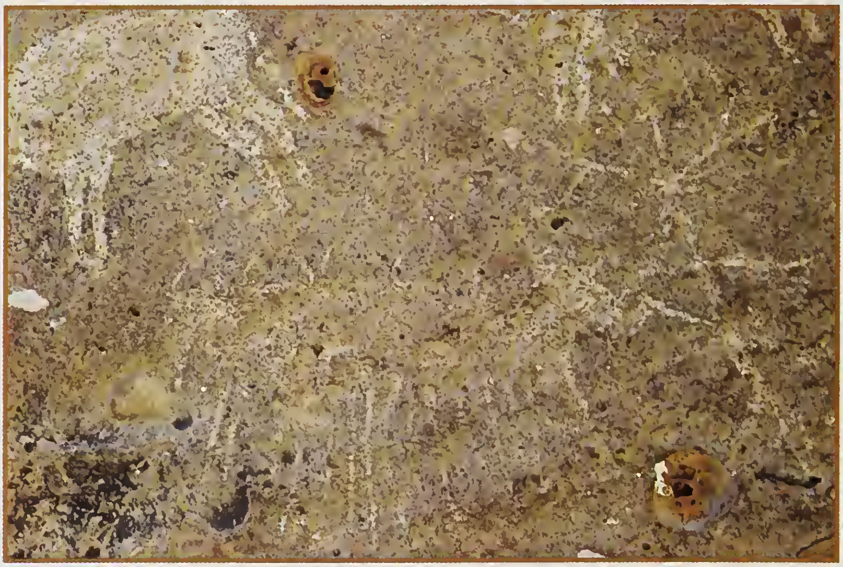
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Figure 13

However, the dedicated amateur can make a valuable contribution in the furthering of our knowledge of rock art, provided he approaches it in the right way. The South African Archaeological Society (Transvaal Branch) P.O. Box 41050, CRAIGHALL 2014 will give willing guidance to aspiring amateur archaeologists. All incoming archaeological data, including rock painting sites, are systematically recorded by a number of recording centres throughout South Africa, including the South African Museum in Cape Town, the Transvaal Museum in Pretoria and those at various universities, where they are stored for posterity and made available to researchers. ◆

Leave that log, now more than ever

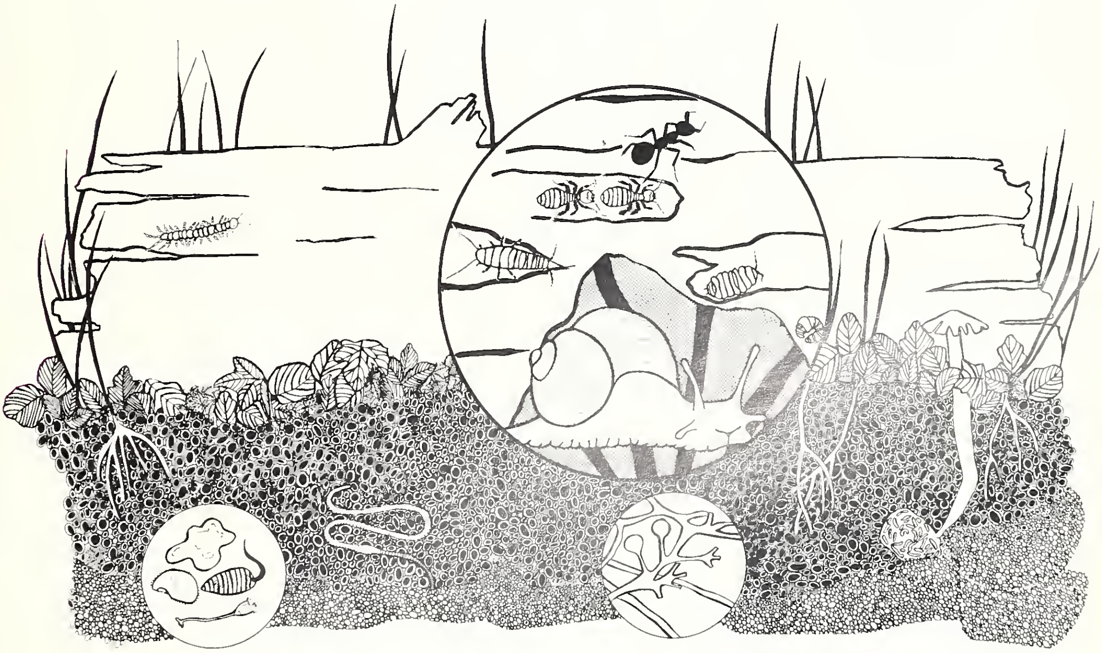
Geoff Lombard

SINCE my first article "Leave that log" appeared in *Fauna & Flora 21* in 1971, thousands of hectares of land have been cleared for cultivation in the Transvaal. Millions of indigenous trees have been felled, piled up and burnt on the new lands and countless dead logs have been collected for fuel. In the Black homelands, many areas that once were thick lush bushveld have been decimated for firewood until today only a sparsely treed landscape or a desolate treeless wasteland remains. In little more than this last decade the Turf Thornveld of the Springbok Flats has been reduced from 34 % to a mere 15 % of its original size, while clearing of bush in the North-Western Transvaal has increased by another 5 %.

Is this a repetition of what happened in the Sahara a hundred or so generations ago? Carthage in North Africa was once the granary of Rome, as well as its source of giant cedar logs for timber. The same process by which we are today destroying the African bush then caused the great Sahara desert to expand until it swallowed the civilization which produced the warlord Hannibal, who tried to conquer Rome with his armoured elephants.

Have you ever considered what a dead log really represents? What is it that you see as you watch the dancing flames of a campfire or feel the warm glow of the red embers?

In the presence of sunlight the green leaves of a



ARTWORK: JEANNIE MENTZ

plant photosynthesise water and carbon dioxide into simple sugars and starches, which eventually become lignin and wood fibres, while giving the ecosystem the oxygen vital for survival. When in turn the wood is burnt, the stored and accumulated warmth and light of a thousand sunny days is released.

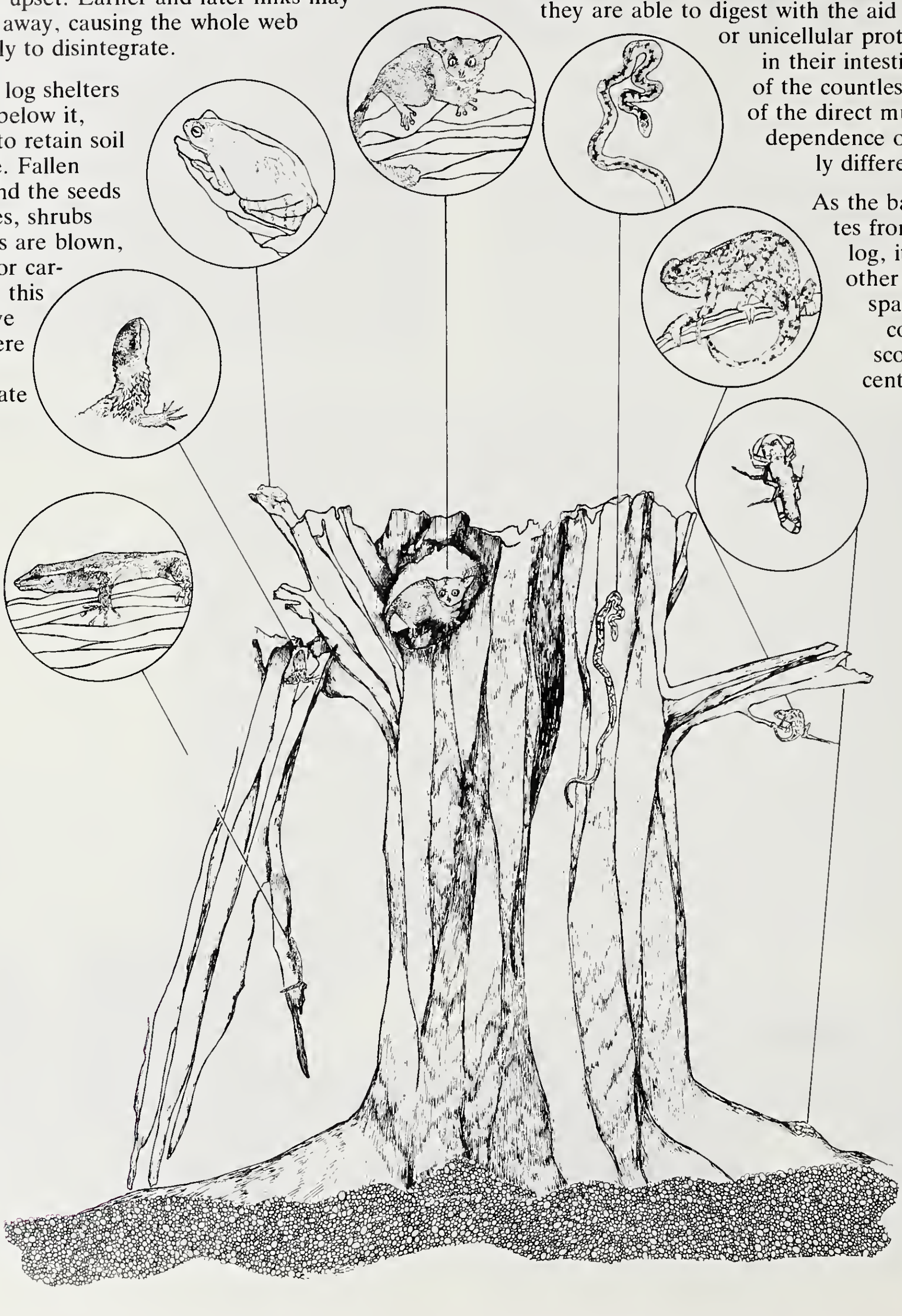
When a tree dies and falls to the ground it in time becomes a little world of its own, forming numerous important niches in the web of life. There is a close interrelationship and interdependence between even the most seemingly insignificant of species, all linking up to form the master pattern. If any niche or link in the food chain is destroyed, the equilibrium in nature is upset. Earlier and later links may thus fall away, causing the whole web eventually to disintegrate.

A fallen log shelters the soil below it, helping to retain soil moisture. Fallen leaves and the seeds of grasses, shrubs and trees are blown, washed or carried into this protective nich where they accumulate as food for a variety of organisms or later germinate as new plant growth.

The first living organisms to utilise the log are bacteria and fungi, which initiate the process of decay by which nutrients are returned to the soil. Here they will sustain the growth of new seedlings and established plants. The fungal threads or hyphae form a fine network which grows around and into the wood cells. Enzymes are secreted, digesting the lignin and cellulose; the wood becomes soft and eventually disintegrates to form humus which enriches the soil.

A variety of insects such as woodborers and termites in the log feed on the dead wood or grass which they are able to digest with the aid of bacteria or unicellular protozoa living in their intestines — one of the countless examples of the direct mutual interdependence of two vastly different species.

As the bark separates from the dead log, it forms another cosy living space which is colonised by scorpions and centipedes and



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a multitude of insects, lizards and geckos which prey on one another.

The next links in the food chain consist of toads, lizards and snakes, birds, shrews, hedgehogs, pangolins, mongooses, bushbabies and a multitude of other small carnivores. At the end of this chain are the larger birds of prey, jackals and other large carnivores.

A second component of this web of life starts with grass and other plants germinating and growing in the shelter of the log. These are grazed or browsed by antelope and domestic stock. The fruits and seeds are eaten by insects, birds, rodents, monkeys and man, who with the other predators also prey upon the herbivores. Throughout all of these links in the food chains beginning at the dead log, animal waste products are dispersed and returned to the soil for the eventual benefit of plants.

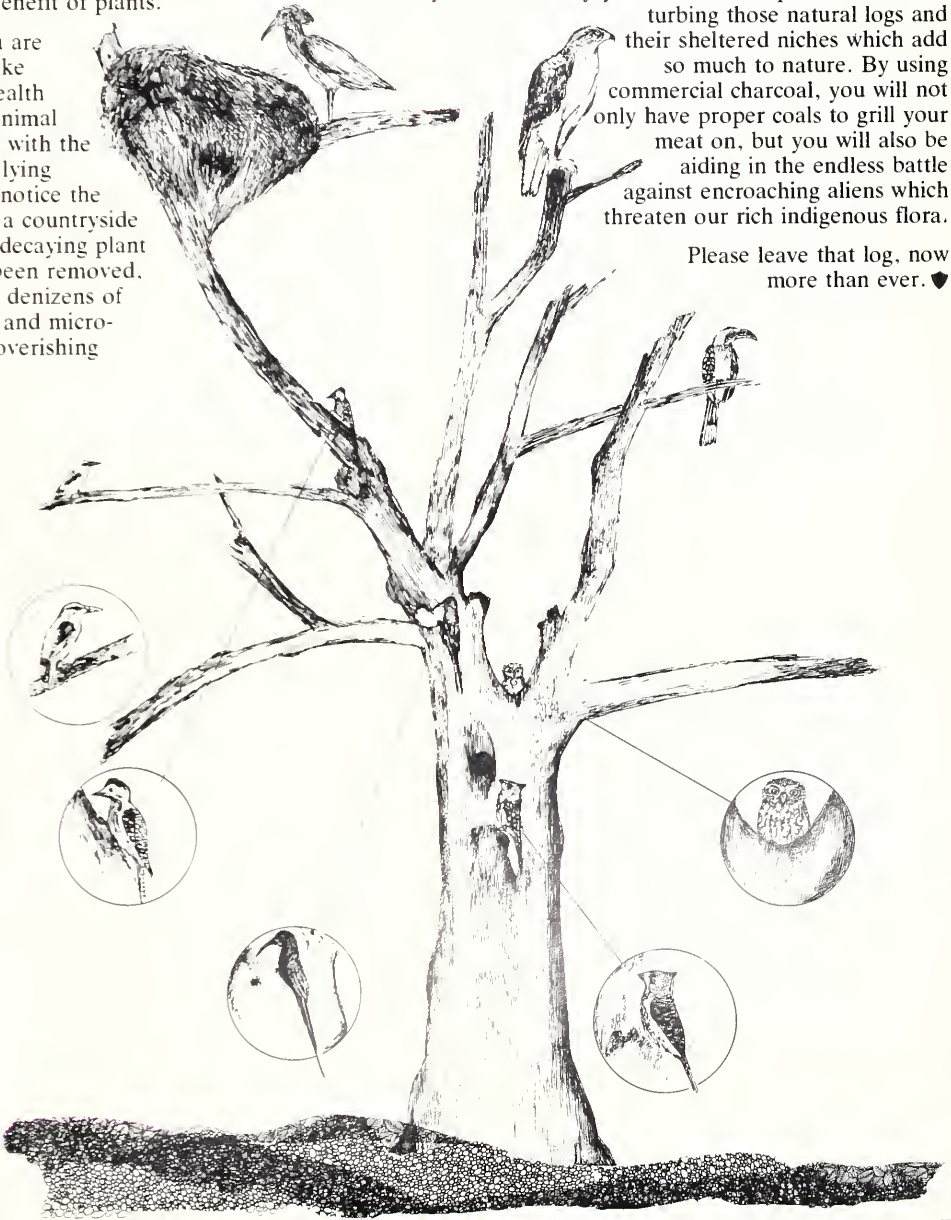
Next time you are in the veld, take note of the wealth of plant and animal life associated with the dead logs left lying around. Also notice the barrenness of a countryside where all the decaying plant material has been removed, depriving tiny denizens of microhabitats and microclimates, impoverishing the web of life so necessary for their and eventually our own survival.

Should you turn over a log or a rock to see what is underneath, it is important to replace it gently exactly as it was. If the log is moved from its original position it may take months or even years for a similar microclimate to be re-established underneath. It is this sheltered microclimate which leads to the full and fascinating complement of plant and animal life in and around a log.

Sufficient firewood is today being commercially produced for human needs and new plantations are continually being established. If you live in the country, plant your own small plantation to satisfy your firewood needs or that of those who come after you.

By buying firewood for your picnics or camping trips you can still enjoy a convivial campfire without disturbing those natural logs and their sheltered niches which add so much to nature. By using commercial charcoal, you will not only have proper coals to grill your meat on, but you will also be aiding in the endless battle against encroaching aliens which threaten our rich indigenous flora.

Please leave that log, now more than ever.



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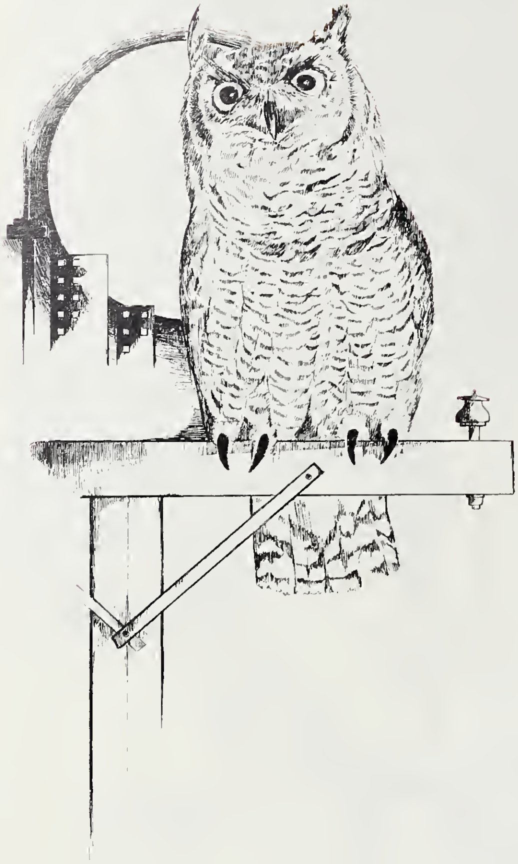

Suburban Owls of Johannesburg

Geoff Lockwood

A HABITAT must fulfil a number of basic requirements to be suitable for any species. There must be an adequate supply of food and water, suitable nest sites and shelter available. Throughout the world, man's increasing impact on the natural environment and the resulting changes have signalled the beginning of the end for many bird species, as borne out by case histories of the demise of many species as a tragic consequence over the past few centuries. The picture is however not totally black, as a number of more adaptable species are slowly expanding their ranges and increasing in numbers in the newly created man-made habitat of suburban gardens. Possibly amongst the most unlikely birds to adapt to this environment have been the owls.

Only the barn owl *Tyto alba* has a historic reputation of associating with man. It often lives in and around homesteads and outbuildings in rural areas, catching rodents attracted by agricultural activities. It is less common in the built-up areas of Johannesburg but occurs in some gardens, frequently using *Washingtonia* palms as nest or roost sites. The diet spectrum has broadened to cover almost any prey that the owls can locate and overpower. Being more common than rodents in suburban gardens, birds form a greater proportion of the barn owl's diet. Insects, other arthropods, snakes and frogs are also taken and this catholic prey selection has enabled it to move right into the suburbs.

The closely related grass owl *Tyto capensis* and the marsh owl *Asio capensis* are equally versatile as regards prey, but have rather more specialised nesting and hunting habitat requirements. Both species prefer the rank grasses and sedges in marshy areas and may still be encountered where patches of this habitat of sufficient size are found within the suburbs. The grass owl, in particular, is dependent on marshy areas and the modern practice of draining and filling wetlands influences its status in any area.

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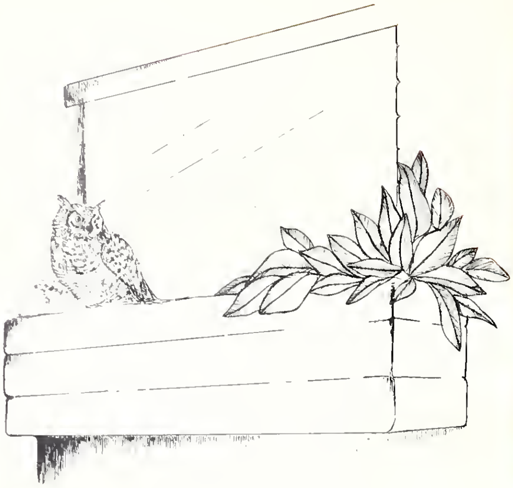
The most surprising species recorded in Johannesburg so far has been the giant eagle owl *Bubo lacteus*. At least one pair of these, the largest of our owls, is resident and breeds in a large open area within the city limits. Studies of the cast pellets show that these formidable hunters are quite content to feed on the rodents available within their habitat, occasionally supplementing this diet with large birds such as Egyptian geese.

At the other end of the scale the smallest owl to occur in Johannesburg, albeit irregularly, is the pearl-spotted owl *Glaucidium perlatum*. This bird prefers *Acacia* thornveld and is fairly common north of the Magaliesberg. Around Johannesburg this habitat type is scarce and discontinuous and the pearl-spotted owl therefore apparently only occurs as a vagrant.

The most successful of all owls inhabiting the suburbs is undoubtedly the spotted eagle owl *Bubo africanus*, due to its versatility in diet and choice of nest sites. In Johannesburg it is surprisingly common and is probably the most numerous raptor in the area, even though its nocturnal habits make it difficult to observe and its numbers thus difficult to determine accurately.

The spotted eagle owl feeds on a wide variety of prey, ranging from termite alates all the way through to large birds such as the speckled pigeon and in one case a guinea fowl. Rodents such as vlei rats, mole-rats, and striped mice; snakes, scorpions, frogs and even freshwater crabs have all been recorded in the diet. The proportion of each group in the total diet of course depends on the habitat types, and therefore the food available within the individual's home range.



The spotted eagle owl is equally versatile in its choice of nest sites, as exemplified by the variety recorded in the Johannesburg area. The owls undertake no nest building as such, but may alter the existing site by scratching out a shallow depression to hold the eggs. Four pairs studied used hollow willow trees, three pairs used multiple forks in trees (two gum and one oak), while three pairs used old hamerkop nests. In the latter case the birds generally nested on top of these large domed structures,

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although one pair preferred the chamber of a half-completed nest.

Another common nest site is a crevice or ledge amongst rocks, particularly in rocky koppies, and a total of five such sites have been recorded. This habit of breeding on rocky ledges and crevices has logically led to the use of the wonderfully secure ledges that man has provided on some buildings. One pair nested for three successive years in the window box of a block of town houses in a north-western suburb of Johannesburg. Another pair nested on the girders supporting the roof of the main grandstand of the Wanderers Club cricket stadium at the height of the Christmas cricket season. The grandstand was well populated at the time — the majority of the spectators being totally unaware of the fluffy onlookers above their heads.

One of the most interesting aspects of nesting behaviour of spotted eagle owls is the fact that the parent birds are often fiercely aggressive in defence of their young. Occasionally reports of owls attacking dogs, cats and people appear in the press. Although painful and frightening — for the approach of the bird is swift and totally silent — these attacks should be seen as an extremely courageous attempt to protect the young and the birds should therefore not be molested. It is also wise to give the immediate area of the nest a wide berth until well after the chicks have left the nest.

Immediately after fledging, young spotted eagle owls seem incredibly stupid, bumbling around on the ground and often not even attempting to fly away when approached. They are thus often endangered by the well-meaning person who finds a young owl that has been "kicked from the nest" and takes it home to "save" it. Even if the person is aware of the young owl's requirements, this rescue effort is almost always unnecessary. It would still have been fed by the parents had it been left where found, or at the most placed in a safe place near the nest. Only when both the parent birds are known to have been killed or permanently driven off could a cautious attempt to rear the bird be undertaken, keeping the legal aspects in mind. It is an offence to keep any indigenous wild bird in captivity — even though you are trying to rear it to independence — without a permit issued by the provincial conservation authority.

Many people still mistakenly believe that once a young owl or any other young bird has been handled, the parents will smell this and reject the youngster. As it happens very few bird species have a functional sense of smell and in almost every case a bird that has been returned to the nest or placed in some other safe place will immediately be accepted by the parent birds. A series of experiments which Chris Nel and I carried out a few years ago clearly illustrates this point.

During November 1979 I was informed that a certain person had found an "orphan" owlet and had been caring for it for several days. I passed this information on to Chris Nel at the Transvaal Nature Conservation Division. He investigated and discovered that another owlet from the same brood had been handed to the SPCA Bird Hospital. After confirming that the parent birds were still around, we retrieved both owlets which by this time could fly short distances and released them back to their parents. They were immediately accepted by the adults, even though they had been parted for seven days.

The success of this first stage prompted us to see if owls with broods of young chicks would foster orphans. We obtained another two orphan owls from the SPCA and introduced these into two other owl families which had young of similar age. In both cases the orphans were immediately accepted and remained with their foster families for some three or four months, by which time they were able to fend for themselves and moved off.

An even more ambitious experiment was undertaken the following year when two orphan owlets which had just started flying were introduced to a pair of owls which had lost their own young in a hailstorm six weeks previously. The adults were seen

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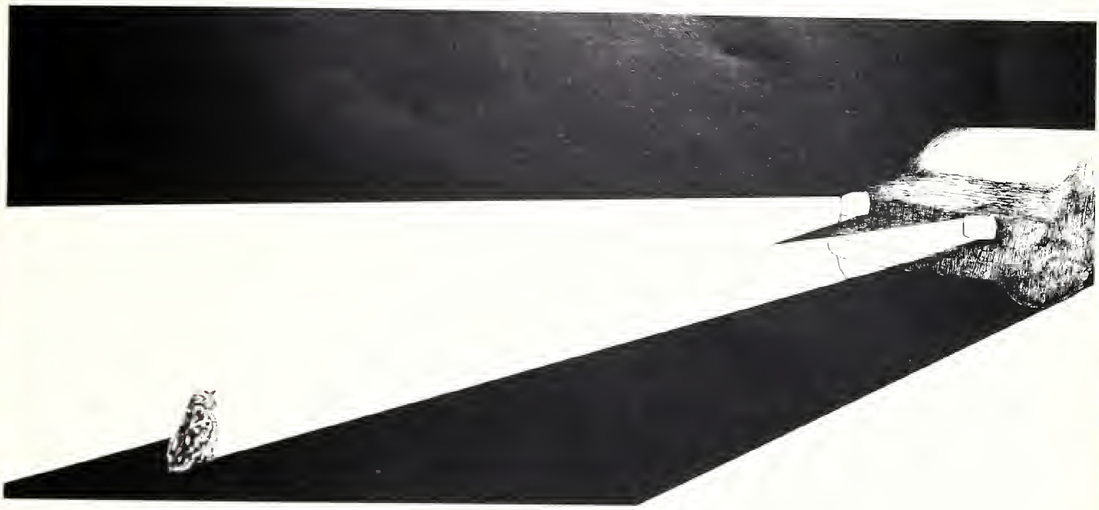
feeding the foster owlets the same evening that they were released. Although one was found dead two days later, the remaining owlet was regularly seen in the company of its foster parents for several months before it moved off.

Although suburban gardens and parks provide suitable habitat for nesting owls, birds in built-up areas face several relatively modern hazards. Perhaps the most serious of these are the activities of nest robbers who illegally remove the fluffy bundles of down to be turned into pets. Unfortunately they then usually try to rear the chicks on mealie-meal porridge or other equally unsuitable foodstuffs and as a result the chicks inevitably die.



Apart from interference at nest sites man has inadvertently introduced several hazards which threaten owls in our suburbs. The most significant are pesticides and motor vehicles. Owls, situated where they are at the top of the food chain, are very susceptible to poisons used to control household and garden pests. Insecticides such as the organo-chlorides are particularly dangerous as they become concentrated through the links of the food chain and cause increased mortality and breeding failure in those species at the end of the chain. Rat poison may be ingested by the owls feeding on poisoned rodents. As these animals move more slowly they are more easily caught and in some areas the owls may in fact selectively catch poisoned prey until they also succumb.

The motor vehicle is a major cause of death in suburban spotted eagle owls. Young owls are particularly vulnerable as they often sit in the road beneath street lights at night, feeding on termites and other insects attracted to the light. They seem to be dazzled by the headlights of oncoming cars and often remain in the road until they are struck by the car and killed or injured.

Faced with these hazards it is not surprising that of 11 spotted eagle owl chicks ringed in the Johannesburg area in 1979, at least 4 died before they were a year old — a mortality rate of 36 %.

The future of owls in Johannesburg and our other cities and towns would thus seem to be mixed. Those species with more specialised habitat requirements, such as the marsh and grass owls, are rapidly losing ground due to the draining of marshes and the taking over of large tracts of grassland for housing and industrial use. Indeed, the status of the grass owl throughout Southern Africa is causing concern. On the other hand, the more adaptable species such as the spotted eagle owl and, to a certain extent, the barn owl have a secure future — especially if the extent of illegal harassment, nest-robbing and accidental poisoning can be controlled.

You can promote the conservation of owls by spreading the message about the valuable role of these birds in the environment. Try to allay the superstitious fears that many people still harbour about owls, as the totally groundless belief that an owl calling on your roof signifies an imminent death in the family still leads to much needless persecution, even in this so-called enlightened age. Be more careful with the use of garden pesticides and rodenticides. Take care when driving at night, bearing in mind that owls often hunt along the roadside. Avoid the temptation of buying the downy owl chicks so often illegally offered for sale along the roads, no matter how appealing they may be. As long as there is a ready market, the nest-robbing will continue. Rather report the matter to the nearest police station or nature conservator.

Only by making the general public aware of the true role and value of owls will we ensure that they, along with our other wild birds, will always be with us. ⬟

ARTWORK: ANNETJIE MULLER, JEANNIE MENTZ

LORNA STANTON

The Roan Antelope:

a Circle Completed

IN an article "Roan antelope — a species threatened" in *Fauna & Flora* 21 of 1971, this magnificent antelope was described as one of South Africa's rarest antelope species, numbering some 350 animals. At that time it was confined to only two areas in the Transvaal, namely the Kruger National Park and the Waterberg in the North-western Transvaal. The Kruger National Park population, consisting of some 270 animals, was relatively secure. On the other hand, the small scattered herds in the Waterberg ranged over a number of privately owned farms and were therefore impossible to conserve effectively. Veterinary regulations prevented roan antelope from the Kruger National Park population

from being moved to areas outside the Park, but the Waterberg population was fortunately not subject to these restrictions.

It was therefore decided to translocate a nucleus breeding herd from the Waterberg population to the relative security of a provincial nature reserve. In co-operation with the landowners, a team from the Transvaal Nature Conservation Division launched the capture operation in 1969 with the realization that the rugged nature of the terrain and the low density of the animals would make it a time-consuming operation. By 1971 a total of 21 roan had been established on the Percy Fyfe Nature Reserve some 100 km east of the capture area, terminating the first phase of the conservation programme.

The second phase entailed the Division's breeding programme on a number of provincial nature reserves. From the outset the herd on the Percy Fyfe Nature Reserve increased steadily, necessitating the enlargement of the roan camp from 500 to 1 500 ha. By 1977 the herd had increased to the extent that 12 animals could be translocated to Nylsvley Nature Reserve to form the Division's second breeding herd. A year later another nine roan were released

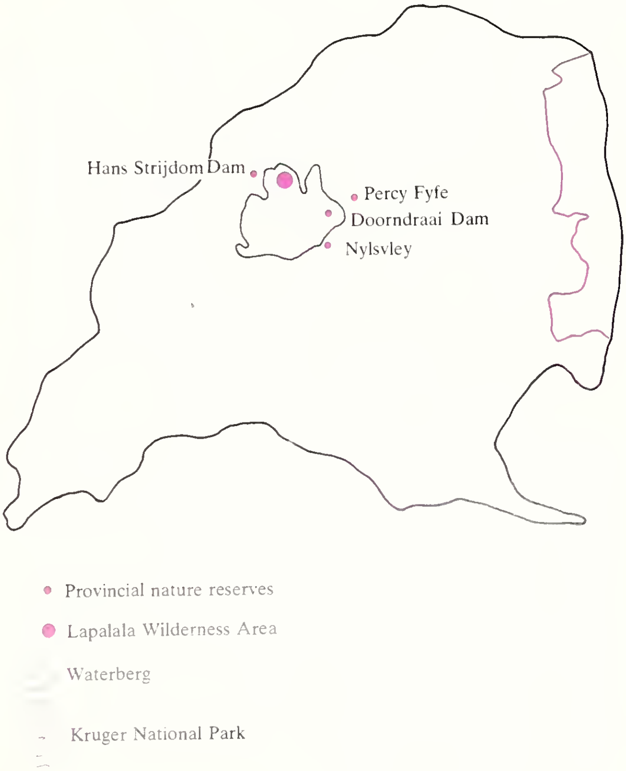


Figure 1: The important roan antelope conservation areas in Transvaal.

J.M. Smith
R. Parris

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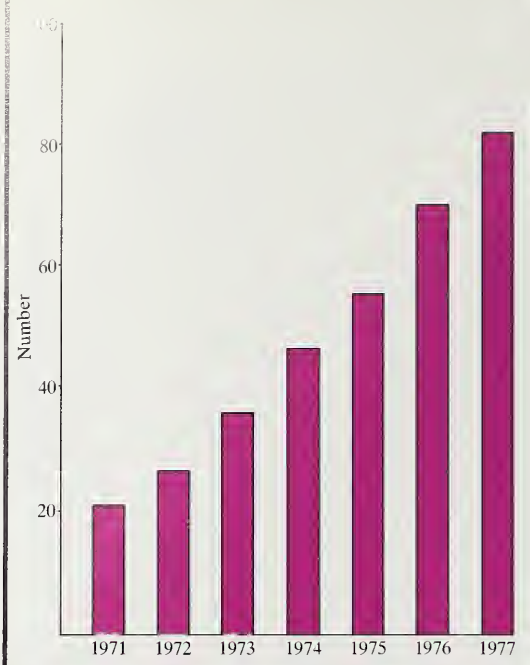

Figure 2: Roan antelope numbers on Percy Fyfe Nature Reserve

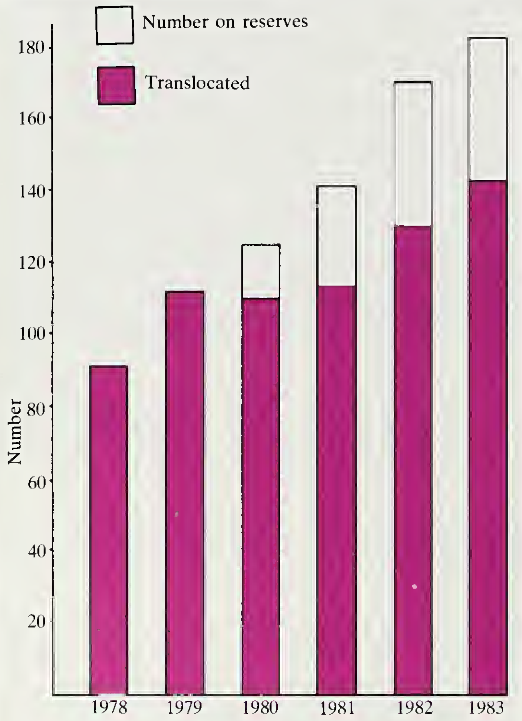

Figure 3: Roan antelope numbers on provincial reserves, and numbers translocated.

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on Doorndraai Dam Nature Reserve as a third breeding herd.

Although roan antelope now occurred on three of the Division's reserves, they were still considered as a single population from the point of view of the breeding programme. The number of calves born in this population is shown in figure 2. Figures 2 and 3 illustrate the progress during the first 13 years of the Division's breeding programme, the population increasing almost ninefold from 21 animals in 1971 to 181 in 1983.

In 1980 the Division could start making small groups of roan available to selected private landowners for translocation to their farms, provided the habitat was suitable. Altogether 40 animals were thus translocated between 1980 and 1983. This stocking of private land was only possible as a secure and viable breeding population had been built up on the Division's reserves, serving as a source of surplus animals.

The third phase of the roan saga involves the building up of the original wild roan population in the Waterberg, thereby securing its status. Two events since the start of the programme have made this possible. The first was the acquisition of the Hans Strijdom Dam Nature Reserve near Ellisras by the Division in 1978. A few roan still occurred along the western boundary and nine of these are now permanently on the reserve. The second event was the establishment of a large private conservation area of 23 000 ha, the Lapalala Wilderness Area, in the heart of the Waterberg, including a number of the farms on which the first roan had been captured by the Division more than 15 years earlier. One of the goals of the landowners is the active conservation of the few remaining wild roan still surviving in the area. They therefore joined forces with the Division to build up a viable and secure population in the area.

In 1984 the first 12 animals, offspring of some of the original animals captured in the area in the late 1960s, were translocated from the Percy Fyfe and Nylsvley Nature Reserves to their former range at Lapalala. With the translocation of additional animals it is hoped to increase the population to the extent that the surplus could be translocated to other suitable areas in Southern Africa.

Although roan occur over much of Africa, as described by Smithers in his book on Southern African mammals, he considers it to be an endangered species in many parts of its range, with the status locally subject to rapid change. This ongoing joint conservation effort was initiated nearly twenty years ago by private landowners and the Division. Success was assured by the expertise and skill of the Division's game capturing team and reserve staff. It is a significant contribution towards the conservation of the roan, both at the southern extent of its range and as an African species. ♦

LORNA STANTON

The Transvaal Hunter: Who, What, When and Why?

THE QUESTIONNAIRE CONSISTED OF 23 EASY QUESTIONS.

Brian Reilly

THERE are probably as many definitions of the concept "conservation" as there are conservationists. But detailed differences aside, these can all be distilled down to "the wise and sustained utilization of a renewable natural resource". "Utilization" *per se* includes hunting as a form of recreation and "renewable resource" includes populations of wild game.

A fundamental attribute of any game population is an ability to reproduce and increase in numbers. This increase generally follows an annual cycle, resulting in an annual surplus. Uncontrolled population growth inevitably leads to the population putting an increasingly severe strain on its essential resources, causing habitat degradation and destruction and ultimately culminating in a population crash or extinction.

In a natural system, population growth is kept in check by predators and many other natural factors. Today, unfortunately, very few systems indeed can still be termed "natural". A drastic decline in the number of predators and restriction of free movement has placed the onus of keeping populations of game in check squarely on the shoulders of man. The regulated removal of the annual surplus is ideally compatible with sport hunting and is essential for the continued well-being of any game population. However, when a greater number is harvested than can be replaced by breeding — when not only the interest but also part of the capital is used — the population diminishes, placing its future and that of hunting in jeopardy. Thus the operative principle here is the "regulated removal" of the surplus.

The Transvaal Nature Conservation Division has as one of its functions and responsibilities the regulation and management of the utilization of renewable natural resources, such as wild animals. Primarily management entails the scheduling of wild animals under various categories (such as non-game, ordinary game, protected wild animals and protected

THE DATA WAS ANALYZED BY COMPUTER ...

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game) and stipulating under which conditions each category may be hunted. In the case of ordinary game, non-landowners require a hunting licence while landowners do not. In addition, the annual hunting regulations stipulate an open and close season for each species for the two categories of hunters in each magisterial district in the Transvaal.

The proclamation of the annual hunting regulations is but the first step in the scientific management of game populations and can only be based on quantitative data such as the number of each species hunted during the previous season. The foundation for the gathering of these data was laid many years ago when it was made a condition of the hunting licence that the hunter fill in the details of his bag and upon expiry return it to the Director of Nature Conservation. Over the years the licence returns have been generally poor, however. Due to lack of manpower and other priorities, the Division has never analysed the data.

With the introduction of the new gamebird hunting licence in 1975, provision was made for gathering more specific data by attaching a detailed hunting return sheet to the licence form and since that year the gamebird hunting data have been analysed annually. In 1982 and 1983 a socio-economic survey of gamebird hunters was conducted through the distribution of questionnaires to licence holders.

As the interest in and demand for furred game hunting has for years shown a steady increase, it became a priority to collect at least baseline data on furred game hunters as well. The only accurate information available at the beginning of 1984 was that of hunting on exemption game farms. It was therefore decided to conduct a questionnaire survey, based on the addresses of the furred game hunters who took out licences during the 1983 hunting season.

A random sample of 5 800 hunters was chosen for the study. Of these, an initial pilot sample of 2 000 hunters received postal survey forms to determine the reaction. A total of 258 of these were returned undelivered and of the 1 742 that were assumed to have reached their destination, 622 had been completed and returned within two months. This percentage of 35,7 is a figure substantially higher than that required for statistical significance.

As the pilot study had doubtlessly proved successful, the full-scale project commenced. The questionnaire, with a covering letter explaining the purpose of the survey, consisted of 23 easy and straightforward questions, covering the following facets:

- The socio-economic profile for the hunter.
- Details of his hunting activities in the Transvaal during the 1983 season.
- His financial outlay on hunting.
- His hunting methods and calibre of weapon or weapons used.
- Utilization of the animal products derived from hunting.
- His opinion of the current licence system.
- His resons for hunting.

Of the total of 5 800 letters addressed and posted, 899 were returned undelivered and it can thus be assumed that 4 901 reached their destination. A total of 1 662 completed questionnaires was returned, realizing a return percentabe of 33,9.

The data on the returned questionnaires were analyzed by computer, extracted in subtotal form and cross-correlated where necessary. The results were too detailed to discuss fully in the available space but the most significant are covered below.

ACCORDING TO THE SURVEY 80.1% OF HUNTERS HUNTED ON FOOT

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THE MOST EXPENSIVE SPECIES WAS BUFFALO AT R3000.

Firstly, the place of issue of each licence was noted and the results quoted as percentages of the total. Most licences were bought in Pretoria (20,78 %) and in Johannesburg (11,27 %). The overwhelming majority of licences were bought in urban areas. The results indicated that 90,5 % of hunters were South African citizens and predictably 99,5 % of all hunters were male.

The socio-economic profile of the hunters was highly significant. The average age of the hunters was between 30 and 49 years of age. Most are involved in commerce and manufacturing and have at least matric as highest educational qualification. A total of 56,5 % of hunters hunted only once in the Transvaal during the 1983 season. The percentages declined through 20,2 % for 2 hunts, 7,9 % for 3 hunts to only 0,24 % for more than 10 hunts for that season. An average of 1,5 hunting trips per licence was recorded. The average hunt lasted 2,7 days but ranged from 8,2 % of the hunters who hunted for 1 day to a maximum of 19,7 % who hunted for 3 days to a minimum of 0,8 % who hunted for more than 20 days. Hunting parties consisted mostly (34,8 %) of 2 people. Other important contributions to the total were hunting parties of 1 person (17,4 %) 3 persons (19,6 %) and 4 persons (15,8 %). A total of 6 784 people were involved in 2 373 hunts, giving an average of 2,9 persons per hunting party. Of the hunters who hunted in the Transvaal during 1983, 8,3 % had never hunted before.

According to official records, 9 162 licences were sold for the 1982/83 season. The licences covered 20 296 head of game. The major species were impala (58,7 %) and kudu (17,9 %). To determine the hunting effectiveness of the hunters, so essential in estimating the total number of animals hunted every year, the number of animals on licence was compared to the number hunted according to the sample. This ratio was recorded to two decimal places and this multiplied by the total of a species on licence provides an estimated total of animals hunted.

According to the survey 80,1 % of hunters hunted on foot. The 30.06 Springfield was the most popular calibre and more than 50 % of hunters shot with weapons of .30 calibre.

An important statistic is that only 5,7 % of hunters were in any way affiliated to either a club or hunter's association.

The most popular month for hunting was July, followed closely by June. This is probably correlated to school holidays.

A mean, minimum and maximum price paid by the hunter to the landowner for each species of game was calculated. An estimate of the total amount paid for game was made by multiplying the number of animals on official record by the hunting effectiveness by the mean price. Mean prices paid per species ranged from R34 for warthog to R70 for impala, R81 for blesbok and R306 for kudu, the last three being the most common species hunted. The most expensive species was buffalo at R3 000.

SOUTH AFRICANS ARE NOT TROPHY HUNTERS, APPARENTLY.

The answers to the question as to what facilities the hunter required resulted in a distinct polarization between those requiring no facilities (23,0 %) and those requiring full accommodation (19,5 %).

As many as 71,6 % of hunters did not pay anything for facilities on the hunting farm. Of those that did pay, an average of R26 per day was recorded.

Most of the game carcasses were used for fresh meat and biltong (39,2 %). A most significant fact was that only 0,12 % of the hunters attached any value to

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NEARLY 20% INDICATED THAT THE ACTUAL SHOOTING OF GAME WAS NOT IMPORTANT TO THEM.

the trophy value of the animal. South Africans are not trophy hunters, apparently.

When asked for their comments on the current licence system 29,0 % indicated that they were happy with the system. A further 28,0 % declined to comment, but as they were given the opportunity to air their opinion it may be construed that this group was not unduly worried by the system.

Nearly half (42,6 %) of furred game hunters indicated that they also hunted gamebirds. A follow-up survey may indicate an increasing interest in gamebird hunting.

When asked why they hunt, 39,8 % of hunters replied for sport, pleasure or relaxation. Nearly 20 % indicated that the actual shooting of game was not important to them.

To summarize, it can be said that the method of data collection by postal survey was highly successful. Most hunters reside in urban areas. The "average hunter" was a South African male between 30 and 49 years of age, involved in commerce or manufacturing with at least a matric qualification. He went on 1,5 hunts of 2,7 days each, thus spending approximately 4 days hunting in groups of 2. His hunting effectiveness is 0,75, thus bagging 3 out of 4 animals on his licence.

He hunts largely on foot using a rifle of .30 calibre and does not belong to a club or hunting association. He hunts during June or July, provides his own facilities ("roughs it!") and uses the carcasses for fresh meat and biltong. He is by and large satisfied or unaffected by the licence system and the chances are 50:50 that he also hunts gamebirds. Hunters in the Transvaal bagged approximately 13 296 head of game consisting mostly of impala (10 126) and kudu (1 960) and paid an extrapolated R1 478 036 for that game. The number of new hunters is of the order of 8 % per year.

This survey has supplied baseline data only. It is envisaged that, if repeated at regular intervals in years to come, it will indicate tendencies and trends in the quality, cost and extent of hunting and will help the Division to perform its catalytic function between landowner and hunter.

Data derived from this type of study enables the Division to base management of game populations on fact and not on conjecture thereby saving time, manpower and money. The game populations obviously benefit from scientific management while the hunter reaps the benefit of the exercise.

ARTWORK: FRED MOUTON

P.B. Fourie

The Hyracoidea

THE earliest datable written reference to dassies can be found in the Bible. Leviticus 11:5 warns that dassies may not be eaten as they chew cud (formally refuted as untrue only in 1965) and do not have cloven hooves. Psalm 104:18 and proverbs 30:26 describe the rocky haunts of dassies and their wisdom in seeking refuge in these places.

In South Africa dassies are mentioned for the first time between 1652 and 1655 in Jan van Riebeeck's diary. The first scientific description of the Cape rock dassie is that of Pallas in 1766. He describes the external appearance and anatomy, as well as the dassie's position in the animal kingdom. However, Pallas considered the dassie a type of guinea-pig, hence the first scientific name *Cavia capensis* which literally means "guinea-pig of the Cape". The common guinea-pig which is used throughout the world today as a laboratory animal has the scientific name *Cavia porcellus*. This refers to a pig-like rodent, hence the name guinea-pig.

In 1780 Storr realized that *Cavia* was an incorrect name for the dassie as dassies and guinea-pigs are poles apart and dassies do not gnaw like rodents. He suggested the genus name *Procavia*, which means "earlier than or before the guinea-pigs" and indicates an earlier evolutionary origin than *Cavia.*

Today, three genera are to be found in Africa, and dassies still occur in the Middle East. The genera *Procavia* and *Heterohyrax* are rock dassies which live on rocky hills, koppies and krantzes. Members of the genus *Dendrohyrax* live in trees in forests and are known for their loud ringing calls during the hours of darkness.

An interesting taxonomic relationship exists between dassies and certain other animal groups. Earlier ideas advocated an affinity with the Perissodactyla (horses, rhinos and tapirs) based on the absence of canine teeth and the structure of the molars. In 1817 Baron Georges Cuvier described dassies as "hardly less than miniature rhinos" in his famous work *Le Regne Animal.*

The modern tendency is to regard elephants and dassies as being somewhat closely related to one another. The lumping together of these two divergent groups is based on the fact that fossils of ancestral dassies from the Eocene epoch (approximately 45 million years ago) had many features in common with the ancestral elephants. Early in the Palaeocene (60 million years ago) this group gave rise to the Sirenia (manatees, dugongs and sea cows). Together with their fossil ancestors the dassies, elephants and sirenians are classified as the Paenungulata or "near-ungulates".

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For many years disagreement existed among zoologists on the finer taxonomy of the dassies. Professor Koos Bothma of the University of Pretoria revised the classification in 1971 and proposed a very convenient taxonomic system which is today generally accepted. A simplified classification is as follows:

CLASS: MAMMALIA

Super Order: Paenungulata

Order 1: Hyracoidea (hyraxes)

Family: Procaviidae

Genus 1: *Procavia*

P. capensis	Cape Rock Dassie
P. welwitschii	Kaokoveld Rock Dassie
P. johnstoni	East African Rock Dassie
P. syriacus	Syrian Rock Dassie

Genus 2: *Heterohyrax*

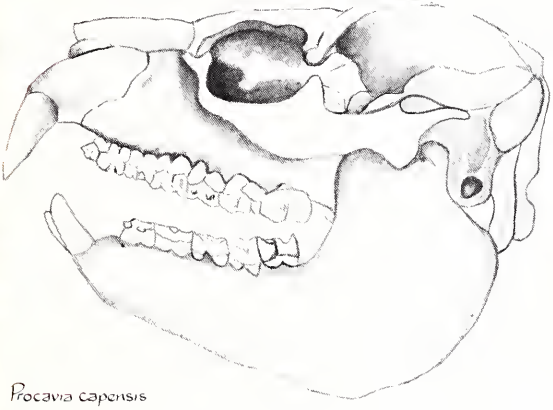
H. antineae	Ahaggar Hyrax
H. brucei	Yellow-spotted Hyrax
H. chapini	Congo Hyrax

Genus 3: *Dendrohyrax*

D. dorsalis	Western Tree Hyrax
D. arboreus	Southern Tree Hyrax
D. validus	Eastern Tree Hyrax

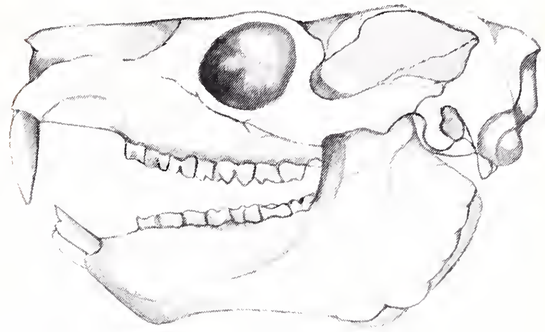
Order 2: Proboscidea (elephants)

Order 3: Sirenia (manatees, dugongs)



Procavia capensis

Dassies are smallish animals with a mass of 2 to 3 kg at maturity. The fur is composed of short stiff hair in *Procavia* and *Heterohyrax* and long woolly hair in *Dendrohyrax*. The colour varies from light grey (*Procavia welwitschii*) to dark brown (*P. capensis*). Dassies do not have tails and have short round ears and pointed faces. The front feet each have five toes, with flat hooflike nails on four of the toes. The hind feet each have three toes, of which the outer two carry flat short nails and the inner carries a long curved nail which is used in grooming. The soles of the feet carry soft pads which are usually moist as this is the only place where sweat glands occur. Dassies cannot dig holes, or climb trees like a cat. Nevertheless, they are very agile, jumping from rock to rock or branch to branch with amazing facility.



Dendrohyrax arboreus

The jaws are exceptionally powerful, with well-developed molars. Canine teeth are absent but incisors are well developed. The upper jaw carries two long curved incisors while the lower jaw carries four incisors resembling a comb and these are also used in grooming. The incisors grow throughout the animal's life, as in the case of rodents, and wear against one another.

A striking feature is the presence of the so-called dorsal gland in the middle of the back. The function of this gland is as yet uncertain but is probably associated with scent production during the breeding season. The colour of the hair around this gland contrasts with that of the rest of the fur. *Procavia capensis*, for example, carries a black spot against a brown background; *P. johnstoni* a white spot against a light brown background and *Heterohyrax* a yellow spot against a greyish background. The hair of the dorsal spot can be erected and serves mainly as a warning signal for other dassies not to approach too closely at the risk of being attacked.

The senses of sight and hearing in the dassie are exceptionally well developed, the animals being able to detect an object and movement at a distance of greater than a kilometre. When sunbathing they have the habit of looking directly into the sun. Many tribes in Africa believe that dassies must be blind to be able to do this. The truth is that the eye possesses a special membrane, the *umbraculum*, which protects the retina and allows light to penetrate only at the sides of the pupil. It is thus possible to detect a bird of prey against the sun without damage to the retina.

Vocal communication plays a very important role in such a highly social animal. Dassies produce a variety of sounds and for this reason sound discrimination is exceptionally well developed. Most of the vocalizations are of low intensity and only audible over short distances — usually a few metres. Dassies can thus communicate with one another without being detected by predators. These low intensity vocalizations include greeting calls, appeasement calls, threat calls and soft warning calls. With these calls the dassies may display their natural aggression

ARTWORK: JEANNIE MENTZ

or the young may appease their mothers during nursing. High intensity vocalizations include the warning bark of a sentry, the territorial call which is usually given at night and may be heard from a distance of several kilometres, and a loud distress call. This call attracts the attention of other dassies, which converge on and attack the predator with their dangerous incisors.

Little is known about the dassie's sense of smell, but it is probably also well developed.

In Southern Africa there is only one mating season, usually late in summer. The gestation period is some thirty weeks, after which two to three young are born. Newly-born dassies are practically independent with a well developed fur, open eyes and agile movements. Immediately after birth the young dassie climbs into the female's back and takes position on her dorsal gland. This ensures that it is marked with the smell of the female and is thus safeguarded from aggressive males.

At the age of approximately 15 months the dassie is sexually mature and becomes a fully-fledged member of the group. Nevertheless, males must be prepared to fight for the opportunity to mate and many are killed during a confrontation with a dominant old male who retains his dominance until he becomes too old.

Procavia capensis

Rock dassies live colonially in rock crevices in koppies, hills and cliffs. At night they huddle together to conserve body heat. During the day they spend a considerable amount of time basking in the sun, only seeking shade when necessary. Each dassie has his own basking site and trespassers are severely dealt with. Dassies are particularly aggressive, but possess many rituals to avoid fighting. They normally lie with their heads away from one another, do not feed in close proximity to one another and utter a variety of appeasement calls when they are forced to move closely past one another. Tree dassies, on the other hand, are solitary and predominantly nocturnal, members of a pair keeping in contact by loud calls. These animals live in hollow tree trunks, but will also bask on rocks.

Dassies normally have two main feeding periods per day, namely early morning and late afternoon. The feeding area is between or near the rocky shelters. Feeding is mostly a group activity and seems to be done with an air of urgency, a big male acting as sentry. A loud bark alerts the dassies of danger, causing them to make a bee-line for shelter.

If they are forced to move further afield they do so in a group as protection against enemies. Their food consists of grass, leaves, berries, small fruit, lichens and moss. During dry periods they will chew the bark of trees, while even highly poisonous plants are eaten without any ill effects. Lizards and insects are at times an unexpected but welcome bonus. Where surface water is scarce or absent, the food provides all the dassie's moisture needs. Its physiology is adapted to life in a waterless environment by a high heat tolerance, high urine concentration, the metabolisation of fat, and other physical and behavioural mechanisms.

As can be expected, dassies have a number of natural enemies. Leopards, caracals and other carnivores may surprise them while feeding but the entrances of their rocky shelters are normally too small for these animals to enter. Many dassies become the prey of pythons, as these reptiles of course have ready access. A number of raptor species such as the crowned eagle, the martial eagle, the Cape eagle owl and the giant eagle owl may on occasion opportunistically catch a dassie. A dassie specialist *par excellence,* however, is the black eagle *Aquila verreauxii.*

A long-term study in the Matopos National Park in Zimbabwe indicated that 99,9 % of the black eagle's prey consists of dassies, while other sources quote a figure of 80 %. These birds live in pairs, each pair defending a home range which varies in size depending on the quality of the habitat and the number of dassies. It has been calculated that a home range of 64 km^2 may carry a dassie biomass of between 67 500 and 282 500 kg. The estimated 510 kg which a pair of eagles and their chick require per year represents only 0.75 % of the *minimum* and 0,18 % of the *maximum* available dassie biomass. The direct pressure on the dassie population is thus negligible.

However, the presence of a predator in the area and the disturbance that this causes may have a strong indirect inhibiting action on any further growth of the dassie population as dassies continually have to be on their guard and seldom move far away from shelter. In areas where the natural predators have been exterminated by man, such as in certain areas of the Karoo and the Orange Free State, this disturbance is now absent and through the years the dassies have colonized the plains in between their rocky koppies. As dassies compete directly with sheep for grazing, this phenomenon has caused considerable vexation among farmers.

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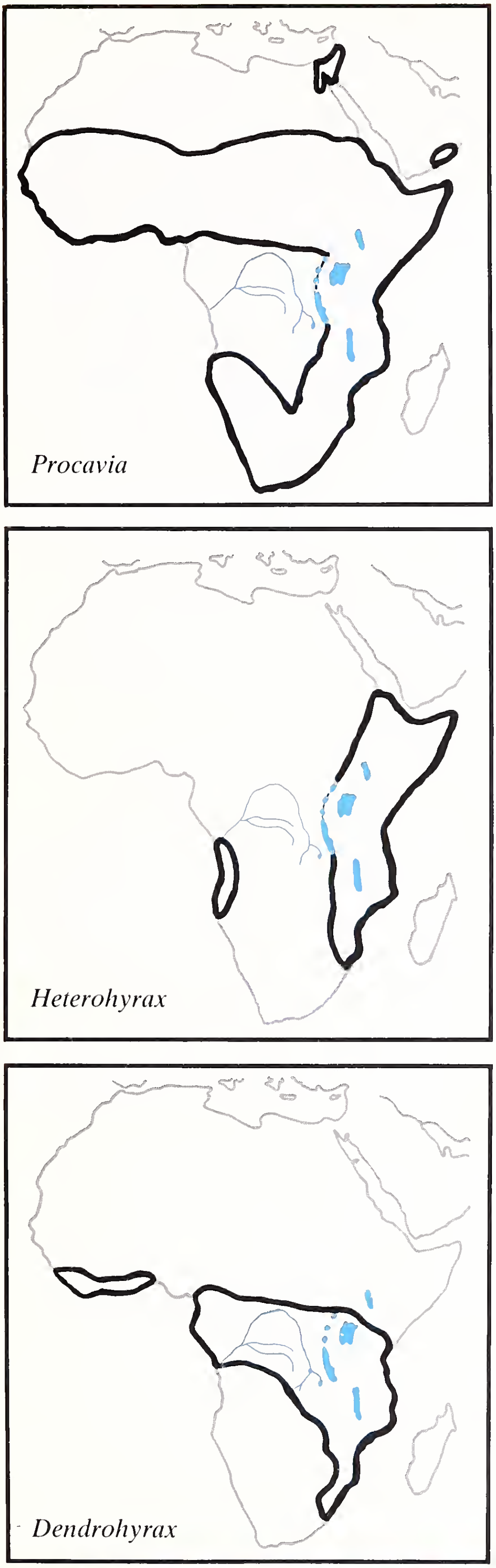

Left: The distribution of the Hyracoidea

Dendrohyrax arboreus

As can be expected from such highly sociable animals, dassies have very clean personal habits. Each colony has one or more specific latrine areas where urine and droppings are deposited. This habit can also be observed in captivity, so much so that dassies which are kept as pets spontaneously learn to use the toilet — without flushing it, of course! In wild colonies the urine and faeces in time form deposits with a hard crust and a characteristic smell which may be seen at places as white streaks against the cliffs. This material, which is known as *hyraceum*, is regarded as having great medicinal powers by many African tribes and is used for, among other purposes, kidney and liver problems and is even said to cure "hysterical attacks".

Care must be taken with identification when dassies in the veld are observed on rocks or in trees. Rock dassies often feed in trees and tree dassies bask on rocks. In a doubtful case the habitat and geographical distribution is more reliable. Rock dassies occur everywhere in South Africa, while tree dassies are found only in Natal.

In parts of Africa the yellow-spotted dassie *Heterohyrax* and the rock dassie *Procavia* occur sympatrically and often share the same living space. In a case like this differences in feeding preference and feeding behaviour could be expected. However, they live together in perfect harmony and even utilize as many as 80 plant species together. Little aggression occurs and the social patterns are similar, although *Heterohyrax* is more inclined to feed in trees and shrubs while *Procavia* is more inclined to feed on the ground.

Up to now the order Hyracoidea has received relatively little attention from scientists, mainly because these animals are difficult to observe and study in their rocky crevices. There is much potential for further research into all aspects of the biology of these exceptional animals.

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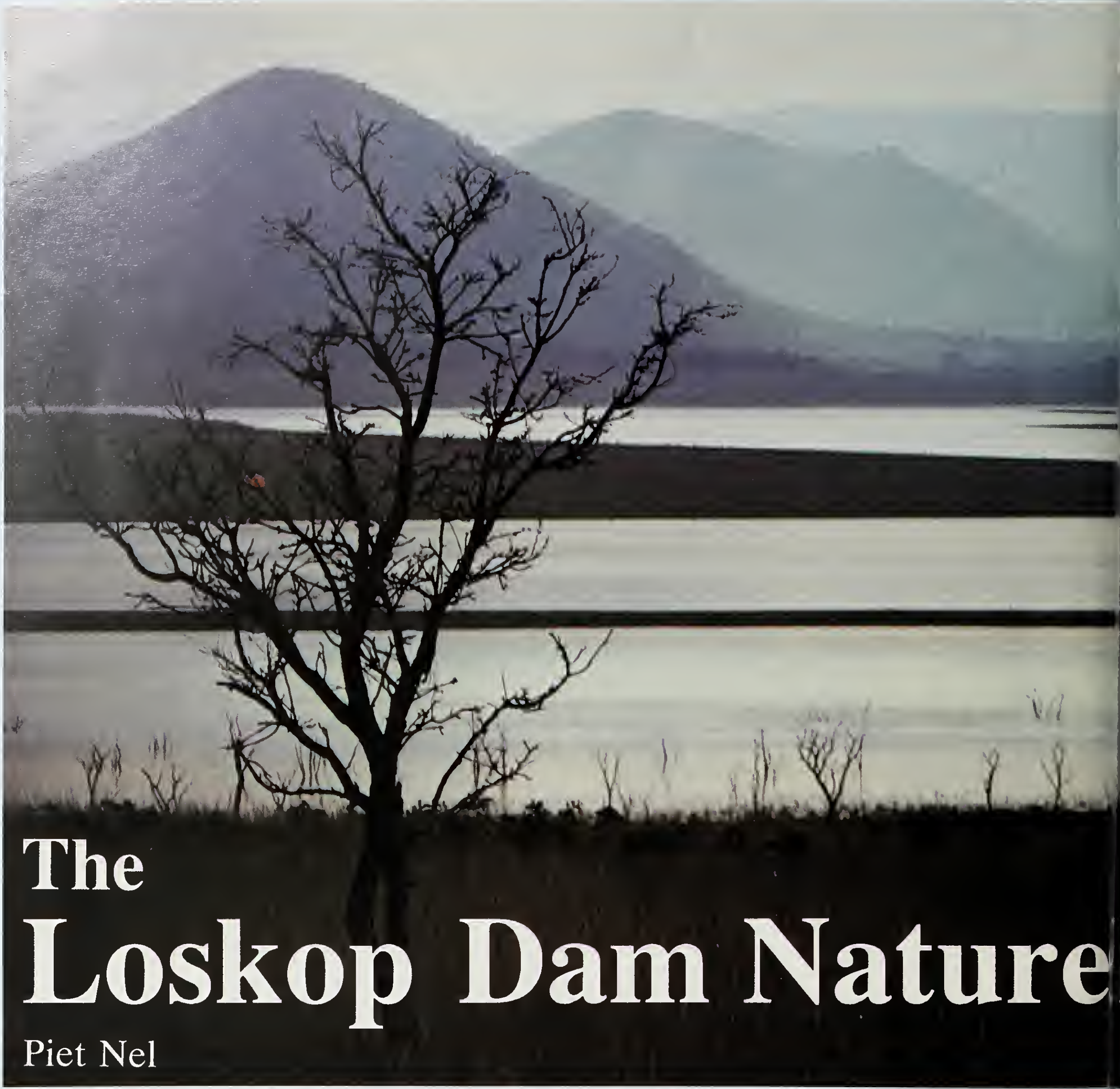


The Loskop Dam Nature

Piet Nel

LORNA STANTON

LIKE an oasis in this rugged country, the Loskop Dam Nature Reserve lies snuggled in between the mountains fringing the valley of the Olifants River. According to geologists, the Transvaal was subject to extensive volcanic activity some 2 000 million years ago. Magma with a granitic composition, today known as Rooiberg felsite, intruded through the earth's crust and spread out over large areas between where Potgietersrus is today to east of Middelburg. The volcanic effusions were interrupted by periods of sedimentation, eventually giving rise to the Bushveld Igneous Complex. Towards the end of this period shallow inland seas formed in the area between the present Loskop Dam and Middelburg. As a result of a continuous interaction between the effusion of magma and sedimentation, landslides and erosion, the area later stabilized to form approximately what it is today.

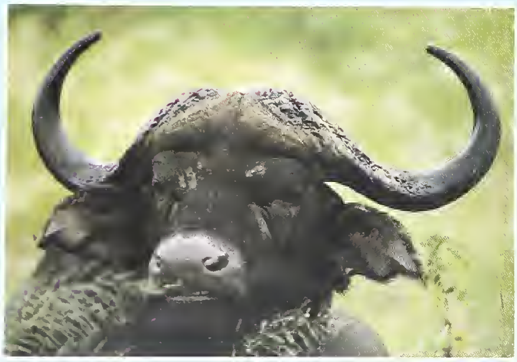
When you follow the road from Middelburg to Loskop Dam across the bare Highveld plains and then descend along the steep winding road through Kranspoort to the valley below, the question "Why are there suddenly so many trees?" subconsciously comes to mind. The answer lies in the steep, well-drained slopes where rocks offer protection to the seedlings of a vegetation type which is sensitive to drought and cold, dry winds and the devastating fires which they fan.

The origin of the nature reserve adjacent to the dam can be traced back to the enthusiasm and perseverence of a handful of Hereford farmers, who founded

Reserve

LORNA STANTON

LEON NELL



PETRI VILJOEN

the Hereford Irrigation Board in 1926 with the aim of constructing a system of canals through this arid country for irrigation of fodder and water for their stock. This was the beginning of a scheme which would later culminate in the construction of the Loskop Dam where the Olifants River flows through a narrow defile on the farms Vergelegen and Loskop. Originally the dam was intended to irrigate an eara of 2 060 ha over a distance of 16 km below the dam wall.

Construction started in 1934 and was completed in 1938. In 1948 the additional canal system was completed after a delay during the Second World War. Today the Loskop Dam supplies a system of canals irrigating some 25 600 ha.

The dam is fed mainly by the Groot Olifants River and its tributaries such as the Klein Olifants and Wilge Rivers. The Hels River and Kranspoort Spruit also contribute water to the dam. Higher up in the Olifants River, outside the boundary of the reserve, the well known "Hel" is situated, its awesome scenery only accessible to those willing to footslog. It consists of vertical incisions in the high cliffs, formed over millennia by volcanic activity and water from the Olifants River.

The Loskop Dam Nature Reserve was proclaimed in 1954 while construction of the first huts at the resort commenced around 1953. The reserve soon became very popular with the public and even in the early days already received some 60 000 visitors per year, as it was the largest provincial nature reserve in the Transvaal at that stage. Several outdoor recreation pursuits such as tennis, rowing, swimming, angling, boating and bus tours through the reserve are available today.

The reserve was subsequently enlarged to 12 760 ha after a game relocation programme had been initiated as far back as 1948. Of all the species, the white rhino was probably the most important. A number of these animals were re-introduced from the Umfolozi Game Reserve in Natal and in 1964 history was made when a rhino calf was born on the reserve — the first outside Zululand for many years. One of the rhino bulls suffered from a kidney disease and unfortunately had to be destroyed, but the carcass was donated to the Transvaal Museum.

The game relocation programme continued and on June 19, 1965 the first giraffe arrived from the Hans Merensky Nature Reserve, while two eland were also released. Sable antelope, nyala, zebra, waterbuck, blue wildebeest, blesbok, impala, buffalo and ostrich followed. Kudu, mountain reedbuck, grey duiker, bushbuck, reedbuck and steenbok still occurred naturally in the area. Although crocodiles formerly occurred in large numbers, they have become much less common in later years, a phenomenon which can probably be ascribed to pollution of the dam by industries and mines in the catchment area. The hippo population was also influenced by the disturbance caused by motor boats. Wild carnivores which still occur on the reserve today include leopard, brown hyaena, black-backed jackal, caracal, both otter species as well as smaller species such as genet.

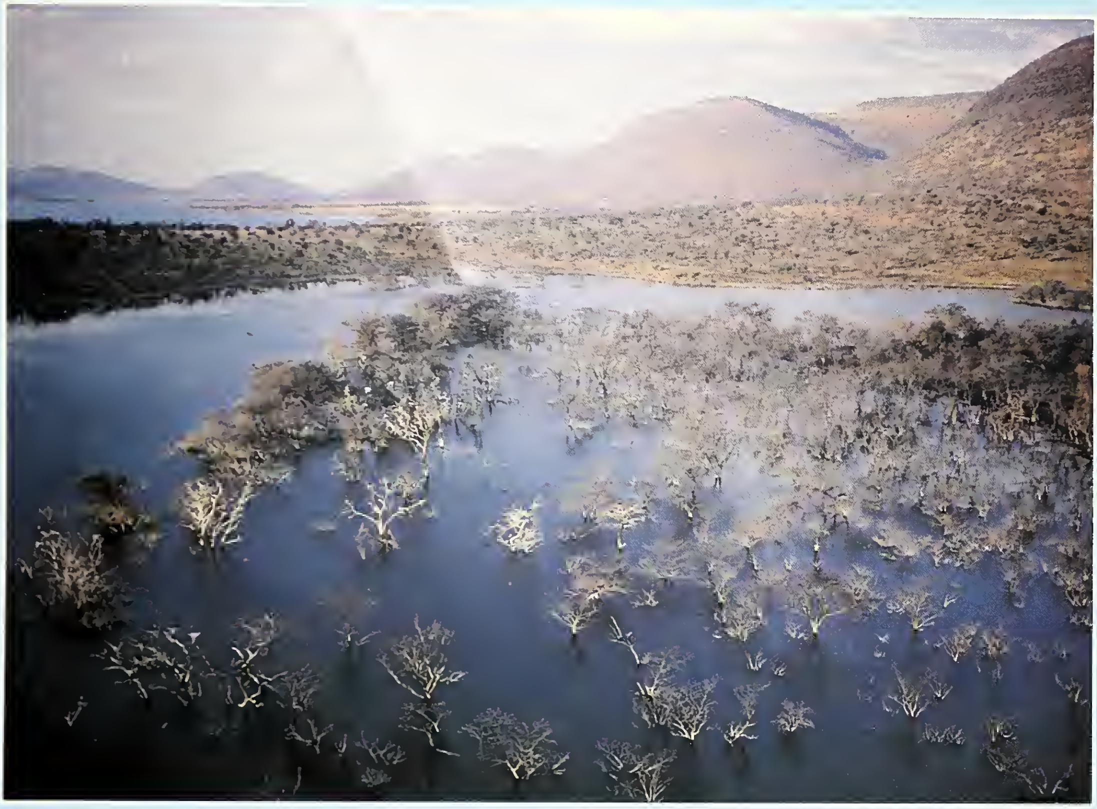
LEON NELL

Through the years most game species proliferated to such an extent that large numbers could be released in other provincial nature reserves or sold to private game farmers, while surplus bulls and rams could be culled and sold to the public.

Since the inception of the reserve, the extent of industrial and mining development has increased dramatically, especially in the Middelburg and Witbank areas. Power stations sprang up like mushrooms in the area from Arnot in the east to Hendrina, Kriel and Kinross in the south. The dam complex is very susceptible to pollution and for this reason the water quality is regularly monitored for abnormally high acid levels. It eventually became obvious that the ability of the dam to supply a reliable source of water in future might not necessarily be assured. For this reason it was decided to heighten the wall by nine metres to utilize rainfall optimally in the catchment area of 1 225 000 ha. This had a far-reaching effect on the resort and the reserve as some two-thirds of the resort, as well as extensive low-lying areas of the reserve, were inundated.

To compensate for the loss of habitat the farm Parys, adjoining the reserve on the west, was bought in 1979. This area of 1 060 ha with its kudu, impala, blue wildebeest, blesbok and impala was fenced off with a rhino-proof fence in 1980 while the old fence between Parys and the reserve was partially removed to accustom the game to the new boundaries. The resort also had to be moved to higher-lying land at great expense.

The reserve is situated in the rain shadow of the Lebombo Mountains and has a very sporadic rainfall of between 625 mm and 750 mm per year. Consequently relatively few moisture-loving shrubs grow in the shade of the trees as the root systems of the latter utilise most of the surface water. The perennial plants occurring on the reserve are all adapted to survive dry seasons. A well-known example is the sweet thorn *Acacia karoo* which blooms early in the winter before the first rain. The families Liliaceae and Iridaceae are well represented and store moisture in the fleshy waterground bulbs, tubers and corms. More than 1 000 species of plants, representing 117 different families, have been recorded on the reserve.



LORNA STANTON

A variety of fish species occur in the dam. Kurper *Tilapia* spp. are among the most important and the blue kurper *Oreochromis mossambicus* has become a favourite angling fish. An international kurper angling competition has been held at the dam for many years and a blue kurper of 3,6 kg was once caught but unfortunately not recorded as a record.

The reserve is a paradise for birdwatchers and more than 200 species have been recorded. The fish eagle which is considered the "voice of Africa" by many people is regularly seen at the dam and breeds every year. Cormorants and darters nest in dead trees in the water and offer much pleasure to boat owners. In the resort hours can be spent observing and studying a large variety of birds.

A great deal of evidence points to this area along the Olifants River having been inhabited by primitive man in prehistoric times. They probably settled here due to the abundance of water, game and stone for the manufacture of tools. The earliest people were already relatively well developed and this Fauresmith Culture existed some 50 000 years ago. It appears that they left the area some time later as a result of severe droughts which made survival impossible.

Some 20 000 years later people of the Middle Stone Age inhabited the valley. They were more advanced than their predecessors and the greater variety of stone tools included those mounted on wooden handles such as axes and spears. These people in time also disappeared to be replaced by the nomadic Bushmen of the Late Stone Age. After this the Bantu-speaking peoples followed. High up in the Kloof on the opposite side of the dam is a large overhanging rock containing some paintings from this period. Wagons drawn by oxen as well as a *touleier* and riders on horseback are depicted. These paintings must have been made during the time in which White trekkers were moving through the area.

A variety of important research projects have been conducted on the Loskop Dam Nature Reserve since its inception, including an ecological study of the reserve by G.K. Theron, a mammal survey by J.A.J. Meester, a study of the climate and vegetation by M.J. Wells, a fish survey by S.S. du Plessis and P.J. le Roux, a survey of the reptiles and amphibians by C.K. Brain, a bird survey by O.P.M. Prozesky, a study of the mountain reedbuck by L.R. Irby, a study of the behaviour of the eland by Rod Underwood, a range evaluation of the reserve by H.L. Pettifer, research on the sable antelope by D.E. Wilson and a study of the habitat preferences of impala by H.L. Pettifer. A number of publications in scientific and popular scientific journals, including earlier copies of *Fauna & Flora*, resulted from this research.

As the human population of Transvaal continues to grow, the opportunities to reserve such large tracts of land for conservation purposes will inevitably decrease. The Loskop Dam Nature Reserve today represents a monument to the vision and perseverance of everyone concerned. ◆

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Front cover: The Speckled Mousebird (*Colius s striatus*), a common resident in suburban gardens, is usually found in flocks of approximately 20 birds. These birds play an important role in the distribution of fruit seeds. Photographed by Janet Matthews.

Compiled by: C Nel, K Holtshousen, S Wolff, C Carstens, E Muller.
Artwork: Jeannie Mentz.
Design and layout: Yigal Nachmias.
Photographer: Janet Matthews.

Education for survival

"EARTH is the only place in the universe known to sustain life. Yet human activities are progressively reducing the planet's life-supporting capacity at a time when rising human numbers and consumption are making increasingly heavy demands on it. The combined destructive impacts of a poor majority struggling to stay alive and an affluent minority consuming most of the world's resources are undermining the very means by which all people can survive and flourish.

Humanity's relationship with the biosphere (the thin covering of the planet that contains and sustains life) will continue to deteriorate until a new international economic order is achieved, a new environmental ethic adopted, human populations stabilize, and sustainable modes of development become the rule rather than the exception. Among the prerequisites for sustainable development is the conservation of living resources.

Development is defined here as: the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life. For development to be sustainable it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long-term as well as the short-term advantages and disadvantages of alternative actions.

Conservation is defined here as: the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment. Living resource conservation is specifically concerned with plants, animals and micro-organisms, and with those non-living elements of the environment on which they depend. Living resources have two important properties the combination of which distinguishes them from non-living resources: they are renewable if conserved; and they are destructible if not.

Conservation, like development, is for people; while development aims to achieve human goals largely through use of the biosphere, conservation aims to achieve them by ensuring that such use can continue. Conservation's concern for maintenance and sustainability is a rational response to the nature of living resources (renewability & destructibility) and also an ethical imperative, expressed in the belief that "we have not inherited the earth from our parents, we have borrowed it from our children."

From Introduction: World Conservation Strategy 1980.

Like many other countries all over the world South Africa is now in the process of responding to the World Conservation Strategy. The Council for the Environment is working on a National Environmental Strategy.

For the sake of tourism it is nice to think of South Africa as a world in one country. But in the field of resource conservation the mosaic of first and third world situations is having a devastating effect. The onslaught on the environment is not only from the ignorance and poverty of third world people but the first world industrialised society is causing pollution.

It is opportune that the Council for the Environment is preparing a National Strategy for Environmental Education.

Politics and the economy can be manipulated to rectify mistakes but nobody can afford the price that nature will exact for ecological abuse.

No lasting peace and stability is possible without ecological stability. This is what environmental education is all about: no luxury, but a prerequisite for survival.

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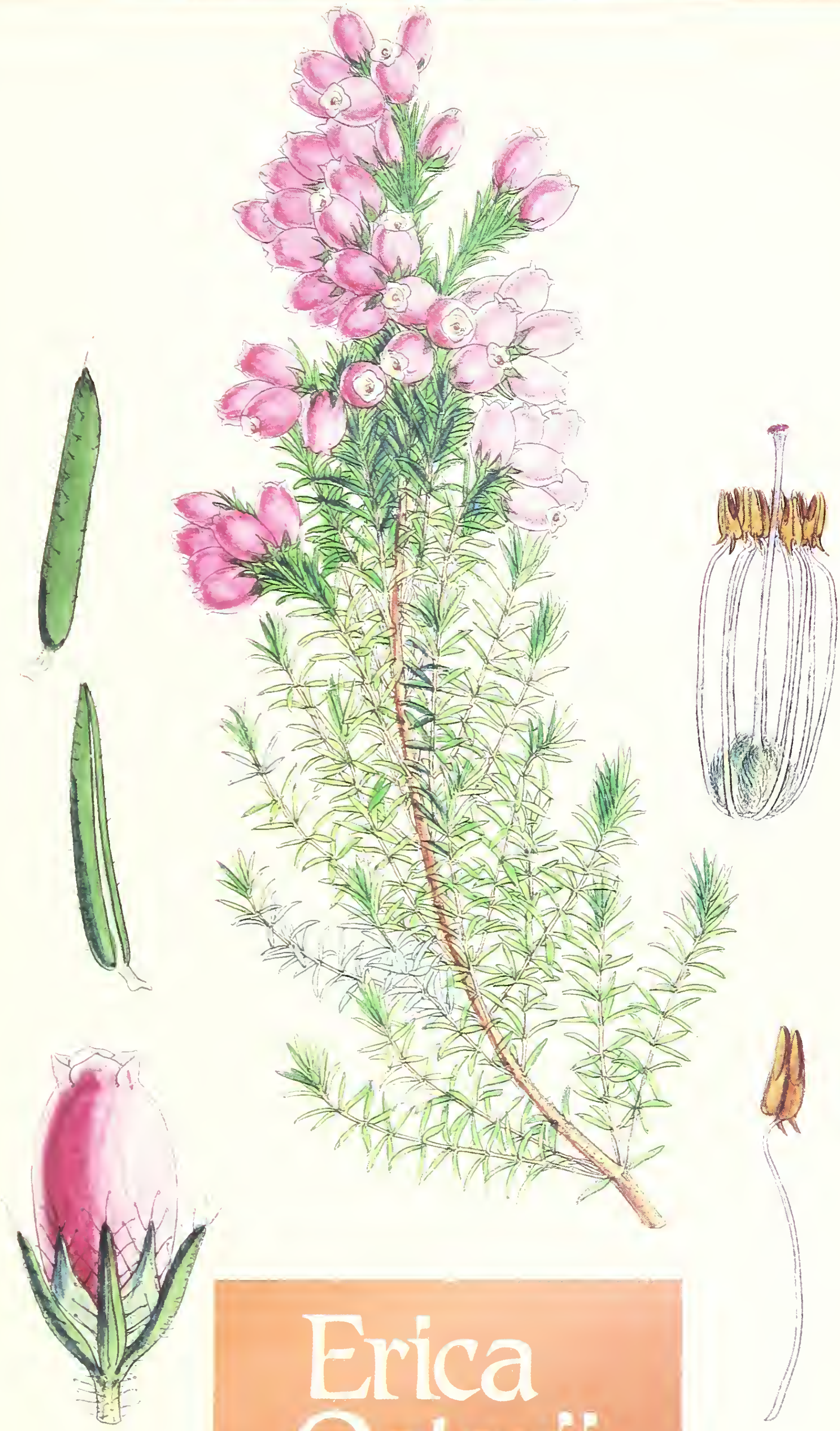
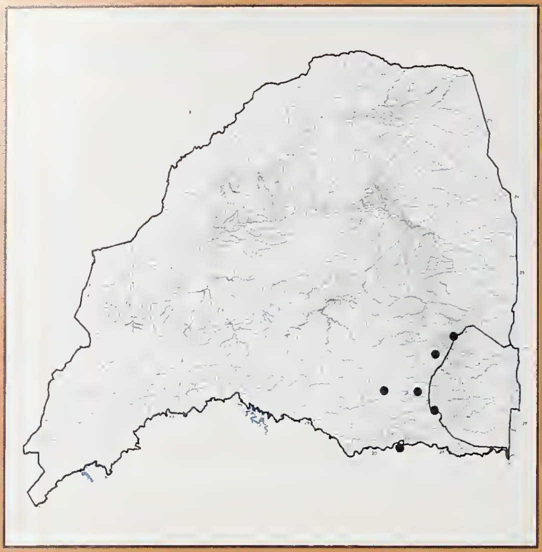


Erica Oatesii

Distribution in the Transvaal



L.G. Oates

FEW people are aware that the genus *Erica* is the largest genus in the flora of Southern Africa. In fact some 640 recognised species are listed in the National Herbarium in Pretoria. The majority of *Erica* species, or heaths as they are commonly called, are found in the Cape Province while relatively few, namely 14 species, occur in the Transvaal. Of these the rare *Erica oatesii* is one of three *Erica* species to receive protected status under the Transvaal Nature Conservation Ordinance. The other two species are *E. alopecurus* and *E. cerinthoides.*

Erica oatesii was named in honour of Francis (Frank) Oates, an English traveller and naturalist, who first collected the species in 1873 "between Pietermaritzburg and the Crocodile River". The exact locality is therefore unknown, but it was most probably in the Drakensberg near Amajuba along the wagon route which took early travellers from Natal to the Transvaal, or from the Wakkerstroom area where subsequent specimens have been collected.

One of the life ambitions of Frank Oates was to visit the Victoria Falls. Accompanied by his brother William, a keen hunter and amateur artist, he sailed from England for Durban in March 1873. The brothers fitted out their expedition in Pietermaritzburg and trekked up by wagon through Natal, the Transvaal and what is today Botswana. On the return of his brother to England, Frank proceeded alone via Bulawayo to the Falls. After many delays he eventually reached them on the last day of 1874. As it was during the height of summer, he was the first white man to witness the splendour of the falls in full spate. His diary records "a day never to be forgotten". Very soon afterwards he contracted malaria and died in February 1875, in what is today Zimbabwe, at the age of 34 years.

After his untimely death his extensive zoological (largely ornithological and entomological) and botanical collection was returned to England. Among his countless specimens was a meticulously pressed specimen of an *Erica oatesii* in its botanical drying paper, which became the type specimen when the species was later described and named in his honour.

According to the records of the National Herbarium in Pretoria, *Erica oatesii* is known from only a few localities in the South-eastern Transvaal although it also occurs in parts of Natal, Swaziland, the Orange Free State and Lesotho, growing in rocky and mountainous country along the Drakensberg. It is usually found near streams and makes a fine show when in full bloom, as the illustration indicates. Today botanists recognise two varieties of this plant, namely *E. oatesii* var. *latifolia* and *E. oatesii* var. *oatesii.*

A considerable number of Frank Oates' specimens were destroyed during his journey when the roof of the primitive hut in which they were stored was blown away during a storm. Sadly also, some spirit jars containing reptiles and beetles were left behind when his collection was conveyed to England after his death. Probably many valuable specimens were lost and his contribution to the natural history of Southern Africa could have been more significant.

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Frank Oates.

LORNA STANTON

TRANSVAAL GRASSLANDS

C.F. Clinning

"On current projections, South Africa will, within the lifetimes of most who read this document, plummet from the present position of affluence to one of extreme resource competition, or poverty".

THE above quote is from a discussion of South African grasslands by Mike Mentis and Brian Huntley, two of the country's foremost ecologists. On what do they base these doomsday predictions? Quite simply on the availability of arable land. The United Nations suggests that 0,4 ha of cultivated land is required to support each person adequately. At its present population level South Africa has 0,57 ha of arable land per person but by the year 2000 this will be reduced to 0,32 ha per person. This is aggravated by the fact that as the population increases more and more valuable arable land is swallowed by the urban and industrial sprawl.

The distribution of arable land in South Africa to a large extent coincides with the distribution of natural grasslands. In fact the grasslands are the most productive region in the country, contributing overwhelmingly to grain, dairy, beef and timber production. They also overlie vast coal reserves and the world's richest goldfields, making them the centre of the country's urbanization and industrialization.

Since the coming of the white man enormous areas of grassland have been irreversibly altered. Urban, industrial and mining development has been a major factor, but massive degradation of the grasslands has also resulted from farming practices. In his *Veld Types of South Africa*, Acocks puts it very succintly: "The conversion of 32 200 km^2 of grassveld into eroded Karroo can only be regarded as a national disaster".

The Transvaal Nature Conservation Division has for some time been concerned about the poor conservation status of grassland in this province. Of the seven pure grassveld and five false grassveld types, only two can be regarded as adequately conserved. Four are not represented in any provincial nature reserves or other conserved areas and the remaining six have inadequately small or non-representative areas conserved.

Pure grass veld types are those in which the so-called climax vegetation is grass. These veld types are situated at relatively high altitudes in regions which are too dry or too cold for the development of any kind of woody vegetation.

In contrast the false grassveld types are maintained through the effect of regular veld fires. The true climax should be forest in the humid areas and savanna or bushveld in the drier regions. These false grasslands are not a recent phenomenon. Although there has been a reduction in forested areas along the escarpment, much of the interior has probably never reached its true woody climax.

The seven pure grassveld types and the five false grassveld types occurring in the Transvaal are shown in the table. The pure grassveld types range from far in the Western Transvaal in the vicinity of Christiana and Bloemhof eastwards to Volksrust, Amersfoort and Bethal. In contrast the false grassveld types are situated to the north and east of the pure grassveld types with the Pietersburg Plateau as an isolated northern outlier.

RICHARD NEWBERY

Gazania Krebsiana

CHARLES CLINNING

Turbina oblongata

Why the precarious conservation status of the grassveld? The reason is very simple. Until fairly recently conservation philosophy concentrated on the establishment of game reserves or national parks to preserve populations of large mammals that had shrunk drastically as a result of man's hunting activities. These reserves were usually established in remote unsettled areas of little agricultural importance. The grasslands, on the other hand, had high agricultural potential, their vast ungulate herds had been largely extirpated, and they were therefore considered unsuitable for the establishment of game reserves. Nature conservation philosophy in recent years has involved a slow subtle shift in emphasis away from the protection of large spectacular animals towards the conservation of ecosystems. To this end the policy of nature conservation departments throughout the country is now aimed at conserving representative samples of each veld type. These sample areas should be large enough to permit the continuation of ecological processes and the maintenance of the full diversity of associated plant and animal species.

With this goal in mind the Transvaal Nature Conservation Division has started evaluating suitable areas within the unprotected grassveld types for the establishment of nature reserves. Finding such areas is not easy. In most grassveld types vast areas have been ploughed up for crop production. In addition afforestation, mining, industrialization and urbanization have taken their toll. What is left in a relatively undisturbed condition are largely atypical areas along drainage courses or hilly areas unsuitable for cultivation.

Conservation status of grassveld types in the Transvaal

Acocks' No.	Veld type	Total area	Area conserved	%
	Pure grassveld types			
48	*Cymbopogon-Themeda* Veld (sandy)	37 531 km²	7,71 km²	0,020
50	Dry *Cymbopogon-Themeda* Veld	47 071 km²	65,52 km²	0,139
52	*Themeda* Veld	10 797 km²	—	—
53	*Themeda* Veld to *Cymbopogon-Themeda* Veld Transition (patchy)	12 115 km²	—	—
54	*Themeda* Veld to Highland Sourveld Transition	2 902 km²	—	—
56	Highland Sourveld to *Cymbopogon-Themeda* Veld Transition	629 km²	—	—
57	North-Eastern Sandy Highveld	14 752 km²	60,91 km²	0,412
	False grassveld types			
61	Bankenveld	30 033 km²	186,04 km²	0,619
62	Bankenveld to Sour Sandveld Transition	1 519 km²	5,15 km²	0,339
63	Piet Retief Sourveld	7 888 km²	26,64 km²	0,337
64	Northern Tall Grassveld	5 405 km²	5,50 km²	0,101
67	Pietersburg Plateau Grassveld	2 489 km²	—	—

CHARLES CLINNING

One may ask then if it is worth the effort and expense to conserve these highly modified areas. The answer is an unqualified yes. It is a fundamental commitment of nature conservation departments to conserve representative samples of the full array of natural diversity, and the grassveld has so much that is unique. The black wildebeest, an antelope endemic to the South African grasslands, had dwindled to the brink of extinction by the 1940s. Thanks to the efforts of a few concerned conservationists the situation is much improved today but the black wildebeest is still regarded as threatened. Similarly the oribi, which inhabits open grassland areas in all four provinces, used to have a much wider distribution than at present. Although it is protected in all areas, habitat change has been the main factor contributing to the species' decline.

The situation among grassveld birds is no better. The bald ibis, an endemic species, is almost entirely confined to North-Eastern Sandy Highveld in the Transvaal and other grassveld areas in Natal and the Orange Free State.

Other grassveld species, notably the wattled crane, Stanley's bustard, yellow-breasted pipit, and Rudd's lark, all depend on undisturbed climax grassland for their survival. The wattled crane requires suitable flooded grassy vleis for breeding. These sponges are often regarded as unproductive by farmers and therefore are drained, dammed, planted to poplar or other trees, or injudiciously burned. Small wonder that the wattled crane is regarded as an endangered species.

So we may go on down the list. The giant girdled lizard *Cordylus giganteus* is, in the Transvaal, restricted almost entirely to the *Themeda* Veld to Highland Sourveld Transition with a slight spillover into the *Themeda* Veld. It also occurs in the Free State in the *Themeda* Veld to *Cymbopogon-Themeda* Veld Transition (patchy). Although there appears to be a large and viable population of this lizard in both provinces, much of its former habitat has been destroyed by being ploughed up for crop production or by the establishment of opencast coal mines and giant new power stations.

Threatened grassland plants include a number of attractive bulbous species like *Nerine gracilis,* various *Gladiolus* species and ground orchids.

In contrast mismanaged grassveld appears to favour a number of other species. Botha's lark is confined in its distribution to the upper Vaal River catchment area. It was probably never more widespread and inhabits areas of extremely short grass, often among the huts of the local population. Any overgrazing or severe utilization of the veld must increase its attractiveness to Botha's larks.

So we find there is much to conserve. Fencing off discrete little areas and proclaiming them in some ordinance as nature reserves may not be the best strategy to adopt for conservation. This is because small reserves, however well managed, cannot contain all the diverse characteristics of an entire veld type. Certainly statutory reserves are important but they should not become isolated islands in a sea of monoculture or urbanization. Private landowners should become aware of the need for conservation and the unique opportunities that exist for them to participate in maintaining so much of our natural heritage.

CHRIS NEL

Gamebirds & Gundogs

Barry Kraut

GAMEBIRD hunting is a very popular form of hunting in South Africa today, with some 3 364 licences having been taken out by bird hunters in the Transvaal alone during 1984. South Africa has followed a world-wide trend and part of the reason has been economic. Gone are the days of unlimited numbers of kudu, impala and wildebeest, all free, and for nothing. The hunting of furred game costs an awful lot of money today, something which I, and no doubt you, have at long last discovered doesn't grow on trees. Bird hunting, however, is still a relatively accessible and inexpensive form of hunting and very little commercialism has crept in here to dog the already heavily stressed John Hunter's shrinking pocket. But don't think that it is not coming. More and more farmers are realising that the francolin, which has always been regarded as a ''mealie seedling pinching thief'', has commercial value if properly managed. This fact will in coming years be quite justifiably exploited by the farmer. In the meantime, press on for tomorrow might be expensive!

Ever played golf without a full bag of clubs, or maybe gone to Loftus without your revitaliser surreptitiously hidden from the prying eyes of the men in blue? Something has been missing, hasn't it? An indefinable but vital factor in the quality of your recreation has been lacking. Well, hunting gamebirds without a trained gundog is pretty much the same. We all know it is possible to do so, but the ultimate aim of all recreation is the maximum physical and mental enjoyment thereof, the attaining of absolute satisfaction. I believe that the only way to do this is with the aid and assistance of the very best of hunting companions – your own gundog.

The noble art of wingshooting can be described as the finding, the despatching, and the recovery of the gamebirds in a sporting and gentlemanly manner. As far as finding the birds is concerned, we human beings cannot even begin to compare with our canine companions – their sense of smell is some 1 000 times more acute than the average man's. Let me put it another way. How many times has your nose told you that a covey of francolin is hiding not more than three metres to your left? The bird hunter without a dog will never see those birds and the only ones he is ever likely to find are those he accidentally steps on, or those that might happen to be feeding in open country. For finding the quarry a trained gundog is an absolute necessity.

The despatching of the bird is something very personal in that you and you alone are the architect of your success or failure. A good clean shot is something akin to a Graeme Pollock off-drive. Timing, stance, swing and concentration have all to be in perfect unison to achieve the ultimate. This difficult task becomes so much easier if a trusty pointer has forewarned you of the presence of a covey by statuesquely freezing on point, his whole body motionless except for the quivering of muscular tension and excitement. You then have time to concentrate on all the do's and don'ts of good shooting and are better able to perform the task at hand.

It is instinctive for the retrieving breeds to bring things to their masters. Once these dogs have been taught to mark falling birds and are obedient to their masters' directional hand signals, very few wounded birds indeed are left behind to die a lingering death and downed birds missed. Without the use of a retriever this task is very difficult and far too many hunters are only too happy to give up straight away, moving on to shoot at the next bird, probably with the same result. Too often does one hear the plaintive excuse, ''Oh, I got nine birds but four were runners and got away!'' The jackals will be very happy, but what a waste...

If I have managed to persuade you that a gundog is a must to achieve the ultimate, then welcome to my world, and allow me to tell you more.

Your first and probably biggest hurdle is to convince your better half that the family actually needs another dog. Your second problem is to decide what breed of dog would best suit your needs. The third is to find a reputable breeder of that specific breed who has *working* dogs in his kennel. This is very important as a great deal of effort goes into the making of a trained gundog. Pups whose parents are not from working strains do probably not have the hunting instinct and would be unable to do the job you have in mind. Find a breeder who regularly runs his dogs in field trials and you can't go wrong.

There are several gundog breeds in South Africa, each with its own speciality. These can be divided into the categories of pointing dogs, retrievers, dual purpose dogs, and flushing dogs.

The breeds in the pointing dog category are the Pointer and the English, Irish and Gordon Setters. These dogs are fleet of foot, having been bred over many generations to cover great distances in search of terrestial gamebirds such as francolins, partridges and guineafowl. Gifted with fine scenting capabilities, they all have the instinctive characteristic of "freezing on point" when their noses tell them they can get no closer to the hidden bird without flushing it. Provided the bird remains sitting the pointer or setter will remain motionless in what I consider to be one of the most exciting and exhilarating of postures. The sheer energy exuded by dog on point in its effort to remain as still and unthreatening as possible to its prey is something, once witnessed, never to be forgotten. The eyes burn with an almost frightening intensity, as if it was attempting to hypnotise its quarry. When two or more dogs are hunting together, and one of them has found a bird and comes on point, the others, on seeing their companion, also freeze and "back" or honour the first dog's find. This is equally exciting and spectacular. It is then the turn of the hunter to move in past the pointing dog to flush the bird or birds. Once the shot has been fired, the dog drops to the ground until commanded, for there could be other birds still hiding in the immediate vicinity. Once the area has been searched and possibly another shot taken on point, the dog is commanded to find the downed birds, either by "pointing dead" or by retrieving if so trained.

Pointers are short-haired dogs better suited to the Transvaal, while setters with their longer fur are more popular in the colder parts of the country such as the Border area of the Eastern Cape and the Natal Highlands. Each of these breeds has its own attributes but space does not permit me to digress further.

JANET MATTHEWS

German Shorthaired Pointer

The retrieving dog is for the man whose preference is for waterfowl shooting. The principal breeds to be found in South Africa are the Labrador Retriever and the Golden Retriever. The latter breed has a much longer and silkier coat. Both breeds are tremendous family dogs with wonderful dispositions, having fine noses and an almost uncanny ability to find and bring back downed and wounded birds, even under the most arduous of conditions. I will never forget one bitterly cold early winter's morning in the Reitz area. A black Labrador had run out over the ice-covered pan and leapt into the freezing water to retrieve a wounded spurwing goose that had come down at least 70 metres from the shoreline. Guided by the odd hand signal from its master the gallant dog swam out to the bird, which had no intention of being retrieved and struck out viciously at the dog with the spurs on its wings. Some 15 minutes went by before the dog managed to get hold of the bird and begin its long swim back. Every hunter around the pan had laid down his gun and willed that brave dog back. Exhausted, it reached the icelip of the pan and tried to climb out, but every time it managed to get its front feet up on the ice, the combined weight of the dog and bird broke through. Again and again it tried, until at last it managed. A spontaneous cheer went up around the pan. A memory – ah, yes, a golden memory!

The dual purpose dog does it all, maybe not as spectacularly as the pointing or as well as the retrieving breeds, but an all rounder it certainly is. The foremost breed in this category is the German Shorthaired Pointer. It is usually mottled liver brown in colour with a docked tail. Not as fast or stylish as the pointer or setter, it will however readily point game and retrieve on command. I believe this type of dog will in time to come outnumber the pure pointing and retrieving breeds, as it is an extremely efficient hunting dog.

JANET MATTHEWS

Springer Spaniel

Other breeds in this category are the Vizsla from Hungary and the Weimaraner from Germany. The Vizsla is a gold-coloured dog, slightly smaller in stature than the German Shorthaired Pointer, but equally effective. The Weimaraner is silver-brown and bigger than the German Shorthaired Pointer. Although excellent reports of the Weimaraner have been received from overseas, I have yet to see a good working dog of this breed in South Africa.

In the flushing dog category are the spaniels, namely the Springer Spaniel and the Cocker Spaniel. These small but plucky dogs quarter the ground in front of their masters within gunshot range to flush their quarry. The hunter usually has warning of the impending flush by the frantic wagging or feathering of the spaniel's stubby tail. The spaniels are also very good retrievers, and being small they are easily transported and are a joy to hunt over. Unfortunately there are very few working dogs in the Transvaal and good working strains are not all that easy to come by. Their long hair is also a disadvantage in our part of the world with all its burrs and blackjacks.

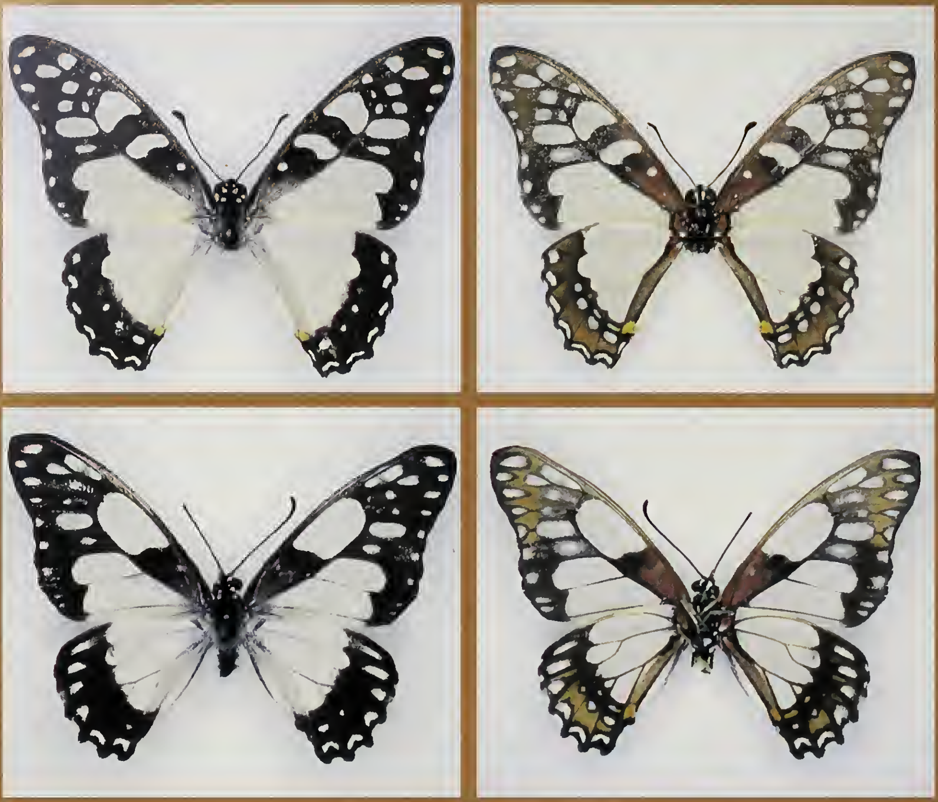
Whatever the breed of your choice, you should if possible take delivery of the puppy you have selected on its 49th day. Research in the USA has shown this to be the ideal age to separate pups from their mother. From this age to the 12th week the puppy adapts to its new home and life and learns the basics of its future life with the family, such as its name, where it is to be fed, and when and where it has to go to answer nature's call. After this period the pup's training as a gundog can begin in earnest. There are many pitfalls awaiting the novice trainer. Although there are numerous good books which can help to broaden the trainer's knowledge, they are but a poor substitute for practical know-how and experience. My advice, based on past experience, is to contact one of the numerous working gundog clubs specialising in your specific breed of dog. Many of these clubs hold regular training courses which assist the novice trainer and gundog to start off on the right footing. A list of some of these clubs and associations is given.

Happy hunting!

Pointers	The South African Field Trial Club PO Box 8465 JOHANNESBURG 2000
Retrievers	The Golden Retriever Club PO Box 12169 CLUBVIEW 0014
	The Transvaal Field Trial Association PO Box 391888 BRAMLEY 2018
Dual-purpose	Hunt, Point and Retrieve Club c/o Mr Joe de Beer PO Box 580 MULDERSDRIFT 1747
Spaniels	The Gundog Club PO Box 105 BREDELL 1623

BARRY KRAUT

English Pointer



JANET MATTHEWS

NYLSVLEY'S NEW BUTTERFLY

Top left and right: A new form of *Graphium (Arisbe) morania* (Angas, 1849) (Lepidoptera: Papilionidae) from the Nylsvley Nature Reserve.

Ernie Grei

On 10 January 1983, a butterfly bearing a superficial resemblance to *Graphium (Arisbe) morania* was collected at the Council for Scientific and Industrial Research's station at Nylsvley. After a cursory glance it was identified as such; only during subsequent comparisons did the extensive dissimilarities between it and *morania* become manifest. Having failed to identify it from available literature, it was taken to Dr Vári, Chief Lepidopterist of the Transvaal Museum. His comment was: "Nobody has ever seen a butterfly like this before." It was also shown to Dr Mark Williams, chairman of the Lepidopterists' Study Group of Southern Africa, who declared himself equally unfamiliar with it.

Although random specimens of butterflies have been collected at Nylsvley since 1976, it was only towards the end of 1981 that a concerted effort to compile a checklist of the butterflies of the Nylsvley Nature Reserve which led to this discovery was made. Absence of substantive evidence in the form of at least one more identical specimen precludes laying claim to having discovered a new species. I describe it therefore as a variety of *morania* on the advice of Dr Vári, as follows:

DESCRIPTION

Graphium (Arisbe) morania var. *holoplaga* var. nov., pl. 1:1-2.

Length of forewing: 35,5 mm.

Ground colour black with white maculae, which in *morania* are slightly more creamy coloured.

Forewing (upper side): Most prominent taxonomic feature is the total confluence of the two white maculae in a single discoidal cell; basal macula in this cell more reduced than in *morania*; distad the next two subcostal maculae are almost confluent and the macula directly below the terminal extremity of this confluence is spatulate instead of elongate as in *morania*; also more reduced are the next four maculae extending downward from the median section of latter confluence; the following three maculae between second median nervule and innermargin differ from those in *morania* in three respects: smaller, white instead of ochreous, and more prominently transected by A1 and Cu2; extending from apex to tornus are nine heteromorphic maculae as in *morania,* but differ from latter in that the two at tornal angle are less clearly defined; proximal portion of discal cell less albescent than in *morania.*

Hindwing (upper side): venation much more clearly defined than in *morania*; proximal maculae between costa and innermargin coalescent as in *morania* but greatly reduced, resulting in a much broader black band between their lateral extremities and termen; distal extremities of first two subcostal maculae more elongate than in *morania*; ochreous spot at base of 3A almost indistinguishable, unlike in *morania*; two minute maculae extending from subtornal area towards apex instead of four as in *morania*; extending from apex to tornus six submarginal maculae which differ from those in *morania* as follows: first elongate, parallel to costa, and almost confluent with distal extremity of first subcostal macula, unlike in *morania* where it is orbicular and more reduced; second as first but not confluent with subcostal macula; third larger and more orbicular; fourth also larger but more reniform; fifth and sixth more pronounced; termen dentate but first four processes extending upward from tornus more elongate than in *morania.*

Forewing (under side): as the holotype shows some slight asymmetry, particularly in the maculae of the hindwings, the description will be confined to the wing described in the preceding paragraph, i.e. the right. Ground colour of forewing: apical and subapical areas: similar to but more ochreous than in *morania*; area between subterminal and subtornal areas and termen: black instead of brownish-black as in *morania*; subcostal maculae as described except the small median macula between Cu1 and M3 and those extending from apex to tornus, all of which display more prominently than in *morania*; proximal portion of distal cell and cubitus and costa of a deeper red than in *morania*, and the ovate black patch distad to red area is larger.

Hindwing (under side): venation more pronounced than in *morania*; the six submarginal maculae between median nervule and base compare with those in *morania* as follows: first elongate not round as in *morania*, second a little elongate; third and fourth more rounded; fifth and sixth slightly reduced; the ochreous band extending from base to eye-spot at base of 3A has a median white stria separating it medianly from A1; basal half of inner margin finely edged with black, not present in *morania*; three small maculae extending toward apex from subtornal area, unlike in *morania* where there are four.

Abdomen: as the abdomen in *morania* displays considerable variation it will not be regarded as a basis for comparison; the ensuing description is therefore confined to *holoplaga*. Dorsal view: A broad, black middle line, laterally with a white macula on each segment. Ventral view: A narrower black middle line tapering toward terminal segments due to the progressively larger lateral maculae.

♀ Holotype: TRANSVAAL, Boekenhout, Nylsvley, 10.1.1983 E. Grei.

REMARKS

Nylsvley is a provincial nature reserve situated halfway between Nylstroom and Naboomspruit in the Northern Transvaal. The Council for Scientific and Industrial Research's research station for the Savanna Ecosystem Project is situated in the reserve. This station forms an integral part of the Foundation for Research Development, and is concerned primarily with the study of environmental factors influencing the ecology of the ecosystem, among others defoliation by caterpillars of the order Lepidoptera (moths and butterflies), as well as the collection of these insects for study purposes. An interesting question now arises: will, at some time in the future, one or more identical specimens be found to justify a claim that a new species of *Graphium (Arisbe)* exists? Whatever the outcome, it cannot be denied that a new addition to one of the best known families of butterflies, the Papilionidae, is indeed a remarkable find.

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GLOSSARY

A1	– 1st anal vein
A3	– 3rd anal vein
Acerate	– needle-shaped
Albescent	– growing whitish
Apex	– top corner of wing
Apical	– top
Asymmetry	– lacking in symmetry
Costa	– margin of wing
Cu2	– 2nd primary vein
Cubitus	– primary vein
Dentate	– toothed
Discal	– cross-vein between 3rd and 4th longitudinal veins
Discoidal	– disc-shaped
Distad	– away from body
Distal	– furthest from body
Dorsal	– upperside
Fascia	– band-like structure
Heteromorphic	– differently shaped at different times
Holotype	– type specimen
Lateral	– situated at a side
M3	– 3rd median vein
Maculae	– spots or patches of colour
Nervule	– terminal portion of (wing) rib
Ochreous	– ochre-coloured
Orbicular	– round
Ovate	– egg-shaped
Proximal	– nearest body
Reniform	– kidney-shaped
Spatulate	– spoon-shaped
Stria	– narrow line
Subapical	– nearly at apex
Subcostal	– below (wing) ribs
Subtornal	– below tornus
Taxonomic	– relating to classification
Termen	– outer edge between apex and tornus
Terminal	– situated at end
Tornal angle	– angle formed by inner margin and termen
Tornus	– bottom corner of wing
Venation	– system of veins
Ventral	– underside
Vestigial	– small or imperfectly developed

Walking Trails

On Transvaal provincial nature reserves

Charl Fouché

INQUISITIVELY, a kudu peers at the strange visitors, its head framed by autumnal mopane leaves. A mountain reedbuck glances back momentarily before white-tailing it over the brow of the hill. Baboons make it known in no uncertain terms that your presence is desired elsewhere. A mixed bird-party emotes in a variety of avian languages as you take up position at a waterhole to observe their antics. Experiences such as these are but a sample of what awaits the visitor on the network of walking trails on nature reserves under the control of the Transvaal Nature Conservation Division.

The term "walking trails" includes hiking trails, nature trails and interpretative trails. Hiking trails are two or more days in duration and include one or more overnight stops, while nature trails are shorter and offer the visitor the opportunity to spend a couple of hours communicating with nature. Interpretative trails are the shortest, normally one to two hours in duration, and contain a series of numbered points along the route which are interpreted in a comprehensive booklet.

Views over apparently desolate plains or wellknown towns are in sharp contrast with the musical sounds of babbling water in a welcome thirst-quenching stream. A variety of vegetation types are encountered on the different walking routes – Lowveld Sour Bushveld with Turf Thornveld and Mixed Bushveld, Bankenveld to *Cymbopogon-Themeda* veld, North-Eastern Sandy Highveld to North-Eastern Mountain Sourveld. A paradise for the keen botanist and a joy for those who only want to experience nature. Bird lovers have a rich variety of feathered folk to observe – from the conspicuous fish eagle, the sharp-eyed lizard buzzard and the colourful Knysna loerie to scores of smaller species such as the crimson-breasted shrike and the emerald-spotted dove.

Details of individual routes can be obtained from the officer in charge of the particular reserve. Each trail starts and ends at the same point, where sufficient parking space is available. Logistic problems are thus kept to a minimum. Prospective hikers on the hiking trails should book well in advance, as only one group is allowed on the route at a time. Advance bookings are not necessary for nature and interpretative trails, but a permit may have to be obtained at the reserve office. Information, pamphlets and maps can also be obtained here, or by writing to the reserve in advance. Although the Blyderivierspoort Hiking Trail partly traverses the Blyderivierspoort Nature Reserve, the bookings have to be made at the Regional Director of Forestry at Sabie.

The biggest difference between the trails on Transvaal provincial nature reserves and most other unguided trails lies in the variety and number of game which may be seen by visitors. Depending on the trail, species such as giraffe, impala, waterbuck, hartbeest, grey duiker, mountain reedbuck and zebra are a common sight. Hikers with a lively interest in herpetology are reminded that if each reptile or frog encountered along the route is observed too intensively they might arrive at the overnight hut well after dark!

Overnight accommodation is as simple and natural but comfortable as possible – stone huts on the Suikerbosrand Nature Reserve, reed huts with thatched roofs on the Giraffe Hiking Trail, wooden huts and stone huts on the Blyde Canyon Hiking Trail. However the necessary facilities are not lacking, with even Feltus' Throne and a shower on the Giraffe Hiking Trail. Firewood is supplied at certain huts. One group, consisting of up to ten people, books a hut for a night on each hiking trail, ensuring privacy and an unforgettable experience.

The Suikerbosrand Hiking Trail and the Blyde Canyon Hiking Trail each consist of several routes, differing in length and degree of difficulty. All routes are, however, within the capabilities of the average fit person. Each hut on these two trails is booked individually and the leader can plan the length of the route to suit the time available.

On foot in nature, with the minimum of padding between him and the environment, the hiker has the opportunity to reaffirm his unity with and his dependence on things wild and free.

LORNA STANTON

JANET MATTHEWS

JANET MATTHEWS

LORNA STANTON

Walking Trails

Walking trails on Transvaal Provincial Nature Reserves		
Nature Reserve	Walking Trail	Description
Suikerbosrand	Suikerbosrand	66 km network with 6 overnight huts.
	Bokmakierie	A 10 km route or a 17 km route.
	Cheetah	4 km route.
Blyderivierspoort	Eerste Liefde	8,8 km, 2 days, 1 overnight hut.
	Op-de-Berg	19,0 km, 4 days, 2 overnight huts.
	Loerie	At F.H. Odendaal Rest camp 3 km.
	Guineafowl	At F.H. Odendaal Rest camp 4 km.
	Bushman	At Bourke's Luck.
	Tufa	At F.H. Odendaal Rest camp 2 km.
	Pot-holes	At Bourke's Luck.
	Marieps	At Swadini. 2 or 4 hour routes.
	Sycomorus	At Swadini 2 km.
	Peninsula	At Swadini 2,3 km.
	Waterfall	At Swadini 1,9 km.
Rustenburg	Rustenburg	Circular route of 20,5 km with 2 overnight huts.
	Peglerae	2 hour circular route.
Hans Merensky	Giraffe	Three day 35 km circular route with 1 overnight hut.
	Waterbuck	15 km.
	Letaba	5 km.
	Mopane	1,1 km

Addresses for Bookings	
Blyderivierspoort Nature Reserve	The Officer in charge Blyderivierspoort Nature Reserve PO Bourke's Luck 1272 Tel: (0020) 15/29 Bourke's Luck
Hans Merensky Nature Reserve	The Officer in charge Hans Merensky Nature Reserve Private Bag X502 Letsitele 0885 Tel: Laparisa (015238) 632/3/4/5
Rustenburg Nature Reserve	The Officer in charge Rustenburg Nature Reserve PO Box 511 Rustenburg 0300 Tel: (01421) 21117
Suikerbosrand Nature Reserve	The Officer in charge Suikerbosrand Nature Reserve Private Bag H616 Heidelberg 2400 Tel: (0151) 2181/2/3
Blyderivierspoort National Hiking Trail	Tel: 196 Sabie

THE TRANSVAAL THREATENED PLANTS PROGRAMME

S P FOURIE

P.A. Raal

ACCORDING to the IUCN Red Data Book for plants, an estimated 20 000 to 25 000 vascular plant species throughout the world are threatened in some way or another. An initial study of the threatened plants of Southern Africa had listed 1 915 species, 216 of which are recorded for the Transvaal. This list was subsequently revised and currently consists of 250 species in 63 families and 133 genera.

Most of the species on this list are adapted to survive and reproduce only within the specific habitats or microhabitats in which they evolved. A number of factors affecting the survival of these plants in their habitats can today be recognized.

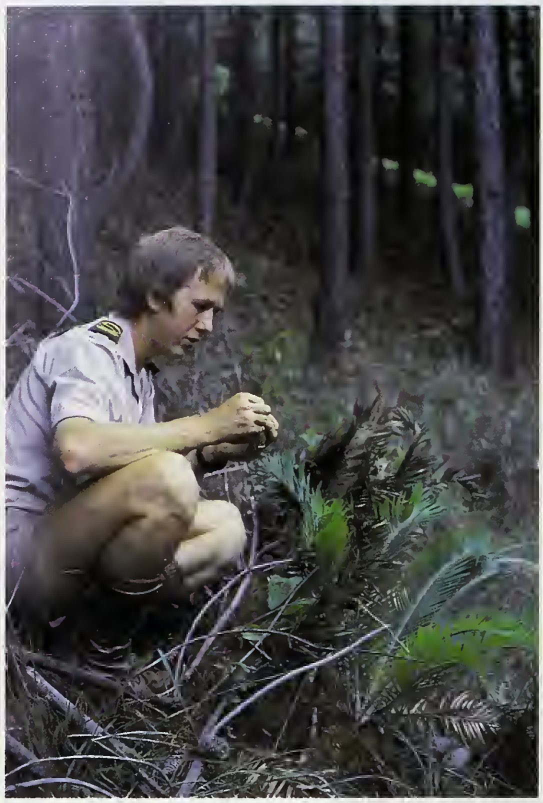
Natural environmental or climatic shifts are perhaps the most important, as they are totally beyond human control. Fluctuations in the climate or environment cause the isolation of plants in refugia where the habitat is similar to that in which the species originally evolved. If these refugia were to be subjected to drastic environmental or climatic change, the species would become extinct.

A second and more obvious factor is the manifold activities of man. The human population in South Africa has one of the highest growth rates in the world, with the result that more and more habitat becomes degraded or lost each year by our inevitable intensification of land use and moulding of the environment to suit our (real or imagined) economic requirements.

Agriculture, afforestation, urban and industrial development, mining as well as dam and road construction have the greatest irreversible effect on natural habitats. The decline of species abundance and distribution in an area can almost always be directly linked to these activities. When they affect a highly heterogeneous habitat area, many microhabitats and the species within them are affected.

Commercial afforestation, by replacing thousands of hectares of natural vegetation with alien monoculture systems, irrevocably destroys natural habitat. Although comprising only 2% of the total area of the Transvaal, plantations cover the most heterogeneous, and thus species-rich, areas. No wonder that more than 30% of

THE TRANSVAAL THREATE


LORNA STANTON

Field work in locating threatened taxa.

the Transvaal's listed rare and endangered plant species are recorded from habitat types similar to those which have been replaced by bluegum, wattle and pine.

Plant collectors, whether collecting for their own gardens or for scientific purposes, may cause species to become endangered or even extinct, particularly if restricted to a limited habitat or range. Collectors have been known to strip an area of all plants of a particular species, especially if monetary gain is involved. Although many collected plants survive in gardens, the wild populations have in many cases been depleted to such an extent that any further disturbance would result in extinction. An attempt to reintroduce cultivated plants into their natural habitat would fail if genetic fitness is lost due to inbreeding over many generations in a protected environment.

Invasive alien vegetation is a major factor in the degradation of our natural habitats. One only has to look at the infestation of *Sesbania*, black wattle and *Lantana* along many of our rivers and streams to appreciate that many indigenous species occurring in these disturbed habitats are under great pressure. Invasive aliens outcompete the indigenous flora for basic resources such as light and nutrients and will become an increasingly serious threat in future.

Uncontrolled veld fires due to farming malpractices or for land clearing can, if regularly repeated, lead to irreversible changes in natural habitat. Fires may even result in the loss of species not adapted to fire. This is particularly evident in perennial species that flower and produce seed sporadically and where regular fires destroy parent plants before they have had a chance to seed. The long-term result is a gradual decrease in the population and eventual local extinction of the species.

In most cases these factors are inevitable and consequently more species will become threatened and will have to be included in the list. The Division of Nature Conservation therefore initiated a research programme to investigate the factors threatening certain species and to determine which require conservation action. The Transvaal Threatened Plants Programme was launched in 1978.

The work was divided into three main phases, namely the taxonomic phase, field work and the analytical phase.

The taxonomic phase entails compiling a list of threatened taxa by the review of herbarium specimens to identify those species with ten or fewer known localities and those species occurring in habitats known to be extensively modified by human activities.

Once this information is obtained, a field dossier is opened for each species in which all relevant information is recorded. The field dossier consists of a complete botanical description, photographs of the growth form, vegetative and reproductive features (flowers and fruit) and a list of grid references and farm localities where the species has been found. General information such as the type description and location, flowering and fruiting times, habitat and veld type in which the plant occurs and literature on the species is also recorded. A map showing the distribution in quarter-degree squares is filed with the field dossier.

All the information kept in the field dossier aids in the field identification and location of threatened plants and helps in the planning of field work.

Phase two involves field work in locating theatened taxa. Field trips are planned to coincide with the flowering period and in areas where the plants are more likely to be encountered. For every plant located in the field, a field data form is completed on which relevant information such as locality, Acocks veld type, vegetation structure, threats to the plant, population structure and population stability is recorded. Herbarium specimens of associated vegetation are also collected for identification so that similar habitat types can be surveyed in future field trips.

ED PLANTS PROGRAMME

JANET MATTHEWS

Field work is very time-consuming and the time available tends to determine how soon the status of a plant in its natural habitat can be determined. Staff spend up to six months per year in the field, locating and monitoring threatened taxa.

The analytical phase is carried out after completion of the field work when, for a particular taxon, no more new locatities can be found. All data collected during field surveys are then processed and a status report for that taxon is drawn up. The purpose of the status report is to determine the conservation status of that species and to recommend a conservation strategy.

The IUCN has established six conservation statuses for threatened plants on which species conservation plans are based. The categories are as follows:

EXTINCT: No longer known to exist in the wild (also used for those species that no longer occur in the wild but survive in cultivation).

ENDANGERED: In immediate danger of extinction if the factors causing the decline are allowed to continue.

VULNERABLE: Recently more widespread and still declining. Plants in this category are likely to become endangered if factors causing this trend continue.

RARE: Represented by relatively few individuals, but not declining in numbers and under no known immediate threat.

INDETERMINATE: Species temporarily grouped here are those known to be in a critical state but which are awaiting further study before being placed in one of the above categories.

UNCERTAIN: Taxa temporarily grouped here are those where reasonably good but unconfirmed grounds exist for believing the taxon to be taxonomically distinct and having a critical conservation status.

THE TRANSVAAL THREATE

The 250 threatened plants in the Transvaal can be placed into the following statuses:
Endangered: 5
Vulnerable: 14
Rare: 117
Indeterminate: 46
Uncertain: 68

Since its inception in 1980, the Transvaal Threatened Plants Programme has accumulated a vast quantity of data on most of the plants on the list. Often it is found that plants are not as threatened or are more threatened than previously believed and in a number of instances some "threatened" plants are in fact very common. A few new species have also been found.

An example of a genus being found to be more threatened than previously believed can be illustrated by a study carried out on the 12 Transvaal cycad species (genus *Encephalartos*). The results showed that all cycad species are inadequately conserved in the Transvaal and that they have become highly threatened. Causal factors include natural and man-made habitat changes in their already restricted natural ranges, their slow growth rates, low natural reproductive rates and the previously unrestricted trade in the plants. It was concluded that attention should be given to the establishment of natural sanctuaries for stable populations of all the species and that they should, in addition, be cultivated *ex situ* for subsequent re-establishment in their natural habitats.

Research on the succulent euphorbias in the Transvaal has shown that 11 species are very rare and in need of urgent conservation. The majority occur on privately owned land. To achieve at least a certain degree of legal protection, they were subsequently declared protected plants in terms of Schedule 11 of the Nature Conservation Ordinance number 12 of 1983.

Various species in the families Asclepiadaceae (milkweeds) and Orchidaceae (orchids) are receiving attention owing to their popularity amongst collectors. Of the first family, *Stapelia calvicorona, Huernia nouhysii* and *Orbeanthus conjunctus*, all from the Soutpansberg in the Northern Transvaal, are the most threatened. These plants have in the past been unscrupulously collected to such an extent that they now occur in only a few very localised spots. Conservation plans and status reports are to be drawn up as soon as sufficient data have been collected.

The orchid *Oberonia disticha* is known from only one naturally occurring specimen in one locality in the Transvaal, again owing to the activities of collectors. Specimens have been collected by the Flora Subsection and are being cultivated *ex situ* in an attempt to produce enough plants for subsequent re-establishment in nature.

Protea rubropilosa and *Clivia caulescens* are two species formerly thought to be threatened and restricted in distribution. Further investigation showed that these plants had previously been largely overlooked and had therefore been recorded in only a few localities. Research on the distribution of these two species and others such as *Gladiolus pretoriensis, Aloe minima* var. *blyderivierensis, Aloe vogtsii, Dombeya autumnalis, Ansellia gigantia* and *Hoodia lugardii* has shown that they are fairly

S P FOURIE

H. lugardii

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Orbeanthus Conjuactus

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Protea rubropilosa

ED PLANTS PROGRAMME

common throughout the Transvaal and have consequently been removed from the list of threatened plants.

Often, when collecting plants, new species are discovered in fairly restricted or localised habitats. Two such recent discoveries are *Gladiolus cataractarum*, of the steep slopes and waterfalls in the Eastern Transvaal, and *Protoasparagus fouriei* along the Olifants and Steelpoort Rivers.

The Flora Subsection also has other duties, such as initiating action to halt threats to plants, carrying out research on critical aspects of survival, re-establishing populations or varieties, creating reserves for threatened plants and promoting public interest in flora conservation.

The Hartbeeshoek Provincial Nursery is responsible for the *ex situ* conservation of threatened species, where plants, seeds or cuttings taken from the wild are cultivated at the nursery. These cultivated plants can subsequently be returned to their natural habitat to augment the wild population. Populations whose numbers have decreased to such low levels that to leave them would mean certain extinction are thus given a new lease of life.

The nursery is also responsible for relocating plants from threatened localities to safe areas such as nature reserves. Those species showing poor natural pollination are pollinated by hand to ensure a higher seed set, thus increasing the reproduction rate.

The Transvaal Nature Conservation Division manages six flora reserves for the sole purpose of conserving rare plant species. These reserves, together with the other 37 provincial reserves where both fauna and flora are protected, harbour populations of 26% of the listed threatened species, including all the Transvaal cycads.

Much of the conservation work will be in vain without public awareness of our indigenous flora. Popular articles are published regularly, highlighting the need for conservation of indigenous plants, while lectures and slide shows are presented from time to time to selected target groups.

In the next few years the Flora Subsection is to concentrate on the completion of field dossiers of previously unsurveyed taxa and the gathering of information on those taxa which have recently been included in the new updated list. Field trips have been planned to those areas with high concentrations of rare plants where habitat destruction is critical. Once the data have been collected, regional reports on those species which have to be considered in development and environmental planning will be compiled. Status reports and conservation plans for each threatened taxon are drawn up as enough data become available.

A monitoring programme to determine how threatened plant populations react to specific management steps was recently initiated. A number of monitoring points will be established at selected sites within the distribution range of certain taxa to determine the stability of the population over a period of time. The conservation status of the taxon is thus monitored, ensuring that it is being adequately conserved.

The overall policy of the Transvaal Nature Conservation Division is to promote the maintenance of the total environment through the conservation of fauna, flora and natural habitats. By carrying out basic research into threatened plant taxa, implementing *ex situ* and *in situ* conservation measures, monitoring vegetation under conservation and promoting public awareness of the need for conservation of our indigenous flora, the Flora Subsection contributes towards the fulfilment of this policy.

J C A HOBBS

POWERLINES, BIRDLIFE AND THE GOLDEN MEAN

Jonathan C.A. Hobbs & John A. Ledger

The influence of South Africa's giant electricity suppliers, Escom, is felt in even the remotest corners of Southern Africa. It is positive in the provision of an electricity supply and employment. It can also be negative, owing to atmospheric pollution and the intrusion of power stations and transmission lines into areas of high landscape quality and ecological sensitivity.

Since the late 1970s the task of managing the environmental impacts of Escom's activities has been the responsibility of a group known as the Environmental Impact Control Section.

All aspects of Escom's work are influenced by this multidisciplinary group, from planning and design through construction and operation to eventual decommissioning and demolition of power stations and the rehabilitation of the environment.

A practical example of the application of this approach is the work of an interdepartmental group known as the Bird Research Committee. Jonathan Hobbs is a senior officer in the Environmental Impact Control Section and chairman of the Bird Research Committee. John Ledger is the Director of the Endangered Wildlife Trust and acts as the ornithological consultant to the Bird Research Committee. Both have visited the USA to study the latest developments and research into the interactions between powerlines and birdlife. Here they discuss the latest activities of this committee.

ESTIMATES suggest that the human population of Southern Africa will more than double in the next 20 to 25 years. This fact, coupled with rising living standards for all of its peoples, makes continuing demands for a reliable supply of electricity an unavoidable fact of life.

For the foreseeable future electricity in South Africa will be predominantly generated by "conventional" means – fossil fuel, hydro and nuclear power. The source usually will be some distance from the consumer and the electricity requires transportation via a network of overhead transmission and distribution lines crossing diverse ecosystems. As the major coal deposits and most of South Africa's industrial and urban development is located in the Transvaal, powerlines will be a major feature of the landscape for many years to come.

An unfortunate side-effect of the transmission of electricity by overhead powerlines is the introduction of an additional source of mortality for some species of birds. Reports of casualties caused by collision or electrocution are periodically submitted by linesmen. The biological significance of this unnatural mortality is, however, still a matter of conjecture.

ESCOM

Over the past two decades many influential statements have suggested that developments such as those associated with electricity provision need not be seen as inevitably in conflict with environmental conservation. At the 1972 United Nations Conference on Human Environment held in Stockholm, Robert McNamara referred to this dilemma not as a question of "whether" development and conservation should be interrelated but "how". Sir Peter Scott also noted that the World Conservation Strategy, drafted eight years later by the IUCN, UNEP and WWF, represents . . . "the first time that development has been suggested as a major means of achieving conservation, instead of being viewed as an obstruction to it".

In similar vein, and closer to home, the government's national policy on environmental conservation of 1980 suggested the need for a "golden mean" to be struck between dynamic development and environmental conservation. More recently the Planning Committee of the President's Council, whilst given a brief to investigate . . . "the principles according to which priorities between development and conservation can be stated", preferred to conclude that it was not a question of priorities but that conservation and development should be accepted as "mutually complementary components of environmental management".

How, then, might this "golden mean" be sought in the case of the transmission of electricity via overhead powerlines when it is in seemingly inherent conflict with the welfare of some species of birds?

For nearly a decade Escom has been applying environmental impact assessment and control principles to its diverse and extensive operations. The positive and negative consequences of existing practices, their alternatives and new developments on biophysical and socio-economic environments are evaluated. The results of such an approach, where environmental considerations are explicitly included in the equation alongside technical and economic expediency, reflect long-term cost-effectiveness, broad acceptability and less impairment of other important resources.

The study of the influence of powerlines on birds, and vice versa, is an example of this approach which has led to the establishment of a multidisciplinary, interdepartmental committee known as the Bird Research Committee (BRC).

The BRC's brief includes the investigation of the interaction between birdlife and powerlines – interactions which can be a hazard to both avifauna and to the reliability of the electricity supply to consumers. Not surprisingly, the latter receives priority in the deliberations. The interruption of supplies and costly delays and damage to conductors and insulators as a result of these interactions had led to the formation of the BRC in the first place. For example, a cement factory in the Western Transvaal was put out of action for 14 hours by a vulture electrocution incident on the line supplying the factory and this, and other incidents, required immediate solutions.

Martial Eagle (*Polemaetus bellicosus*)

More recently, barbet and woodpecker nesting and feeding activities, as well as termite infestation on wooden poles in the Northern Transvaal, have indicated to Escom that the useful life of certain lines was rapidly running out. Cape sparrows using discarded pieces of wire as nesting material in sensitive equipment in substations and social weavers nesting on wooden pole powerlines in the Kalahari have recently been studied due to the electrical problems they cause. In wetlands or other areas where large flocks of ibis, herons and egrets regularly roost on towers the accumulation of excreta on insulators frequently lead to "flash-overs" and the consequent interruption of the electricity supply. A flock of more than 100 bald ibis were recently implicated in such an incident north of Witbank.

Nor do birds seem to pay much respect to the state of the art in transmission technology, as was recently witnessed on the new generation of 765 kV guyed towers conveying power from Standerton down to the Orange Free State. Even before the line had been energised, guineafowl were roosting on the lower parts of the towers, filling the cup-like bases with highly corrosive acidic excreta.

Although such events are of primary concern to an electricity undertaking, measures taken to prevent them are compatible with conservation interests. Preventing line outages in the Western Transvaal makes financial common sense to Escom, at the same time removing a high hazard situation for the endemic and vulnerable Cape vulture and the threat of veld fires to the farming community when electrocuted birds fall to the ground in flames.

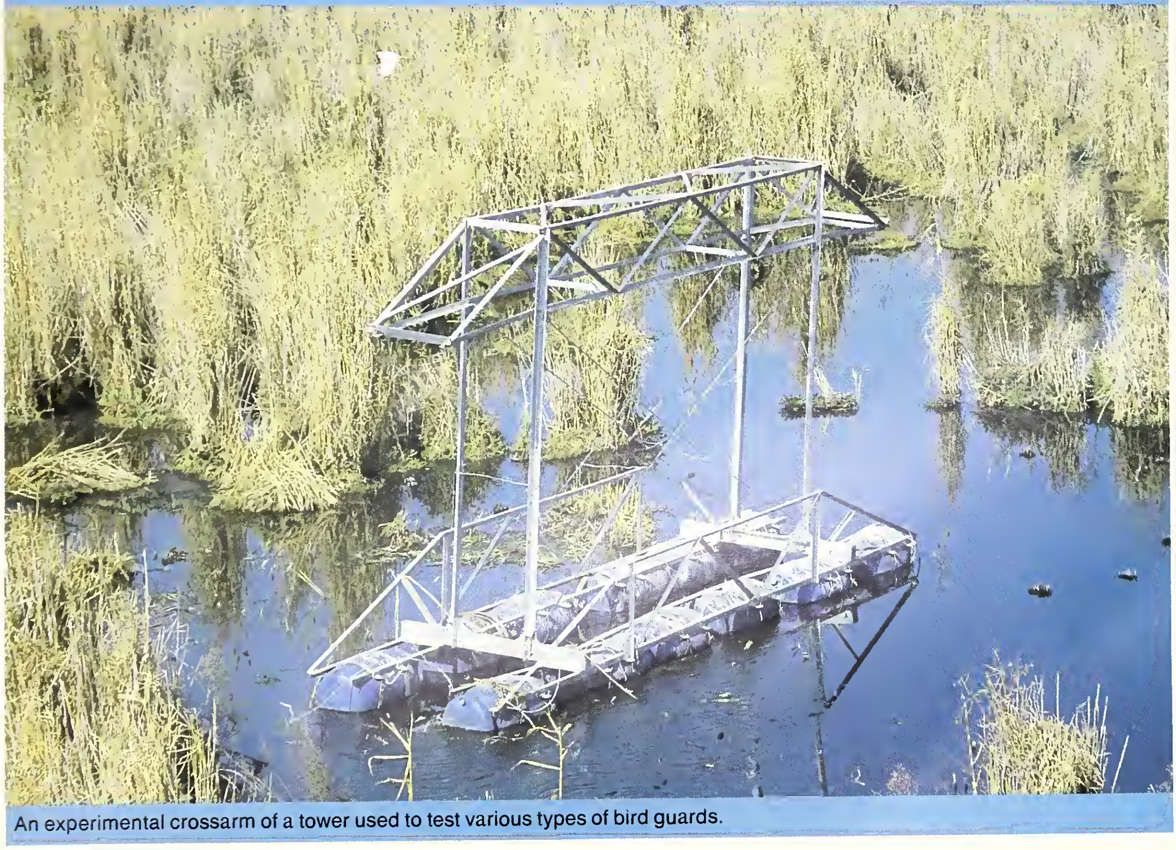
Often a committee eventually becomes an end in itself, but the work of the BRC has led to some very real practical solutions. One of the first was to develop "bird-guards" of various simple designs to discourage birds from sitting above critical parts of a tower. To investigate the responses of birds and the effectiveness of different designs, the crossarm of a tower, fitted with various types of bird-guard, was floated onto a wetland area heavily utilized by waterbirds near Lenasia. The most economical and effective bird-guard which would not be a hazard to live-line crews was thus identified.

Vultures have (or pose) few problems on the lattice steel transmission towers now most commonly used by Escom. This was unfortunately not the case with early tower designs, especially the so-called 88 kV Kite construction formerly so widely used in the Transvaal and which was lethal to vultures and other large birds in the process of landing or taking off, particularly in wet weather.

Research into various modifications led to the development of wooden pole perches which have been fitted to the top of some 200 of these structures at a materials cost of some R10 per tower. This provides a cheap, attractive perch for birds and discourages them from sitting in the critical areas where the possibility of electrocution and consequent line outages is greater.

The competition for perching space amongst vultures still results in late arrivals being left little option but to go into the critical area. Because of this, PVC spiral insulators have been adapted to fit over the central phase conductors. Eventually, the phasing out of this type of tower will eliminate the problem of a design which is simply incompatible with the large wingspan of a Cape vulture. Until then, success is being achieved with these relatively cheap modifications.

Martial eagles are no candidates for architectural awards when it comes to building nests. These are generally large and untidy structures which, when built on towers, pose a potential threat to electricity supplies and a hazard to maintenance crews. In the early days, encouraged by some (perhaps misguided) farmers, Escom's line inspection crews commonly destroyed these nests. This was soon found to be a futile exercise as the vacant site was either reoccupied by the same pair of eagles, or used by a different pair. It is now accepted practice for linesmen


J C A HOBBS

An experimental crossarm of a tower used to test various types of bird guards.

to remove any potentially threatening sticks from the nest by trimming – a viable alternative to complete destruction. Some species such as pied crows and black crows are prolific nest builders and may use bits of wire or other metal in the construction of their nests. In this case removal may become necessary.

The BRC is now investigating a further development based on the experience of American utility companies with golden eagles. Nesting platforms which can be placed in safe positions on the towers have been developed there. Similar structures may prove to be suitable in South Africa for the nesting of certain species such as martial, tawny and black eagles.

The use of towers as nesting sites is not necessarily a threat to electricity supplies. In fact these structures may be ecologically significant in allowing certain species to extend their range. They also provide unique opportunities for ornithologists to conduct research. Escom from time to time accommodates requests from scientists to monitor bird activity on powerlines. In the Transvaal Dr Alan Kemp has been studying the greater kestrel and other smaller birds of prey using abandoned crow nests on pylons. In the Cape Dr Andre Boshoff is conducting research on martial eagles which use Escom's towers as vantage points and nesting sites in the relatively treeless Karroo. The provision of nesting sites for species such as tawny and martial eagles has important conservation implications as they need all the suitable sites they can get their claws on.

Early in 1985 Escom joined forces with the Anglo American Corporation and the Transvaal Nature Conservation Division and initiated research on bird collisions on the Blesbokspruit between Springs and Nigel, which incorporates the Marievale Bird Sanctuary. Avoiding agricultural land and land scheduled for residential and industrial development, Escom's powerline route planners had many years ago utilised this seemingly blighted area, bordered by gold mine tailings dumps and fed by sewer outlets, as an obvious corridor for its transmission lines. Contemporary planners, on the other hand, consider the implications of such high hazard, high bird activity areas and avoid them if possible. This is in spite of the fact that deviations can be expensive and consequently have to be well motivated.

A few waterfowl species are highly susceptible to collisions with conductors and guardwires. Injured ducks, geese, other waterfowl and flamingos and their carcases are regularly found under the lines at Blesbokspruit. But quite apart from being unacceptable in its own right, how significant are these collisions to the populations concerned and to the reliable supply of electricity? Does the presence of the lines limit the use of available habitat underneath? If such events are significant, what are the most effective ways of correcting the situation? These are the kind of questions the research of Mark Longridge has to find answers to.

As an immediate step to prevent collisions the BRC has developed guardwire markers – orange aluminium spheres – which have been fitted to new powerlines across the Nyl floodplain near the Nylsvley Nature Reserve and across the Karringmelkspruit Gorge near Lady Grey. They have also been adapted for use by the SABC and fitted to the guy-wires of its 250 metre transmitting tower on Kransberg in the North-Western Transvaal, owing to the numerous collisions of young Cape vultures with these cables. Young birds are apparently too intent on mastering the intricacies of flight to concentrate on the less easily visible hazards in their way.

It is suspected that most waterfowl collisions on Blesbokspruit occur when bird flight activity is greatest (such as during migration) and when visibility is poor, in other words at dawn or dusk or during inclement weather conditions. To increase the visibility of powerlines, a glowing fluorescent marker has been developed by Escom's scientists.

JOHN LEDGER

Dead vulture – another victim of powerlines.

Regular fault records indicating weather conditions and the type, cause, and duration of faults are submitted by Escom operations staff and computerised. This adds considerably to the understanding of the relationship between bird activity and the interruption of electricity supplies. To refine the data input a short field guide has recently been prepared to enable Escom staff to identify the species concerned. In the Eastern Transvaal Lowveld fault records suggest that snakes may also require some attention as they too have been found guilty of sabotaging the electricity supply.

Along with the work of the BRC, other Escom personnel have exercised their own ingenuity in solving urgent problems of birds conflicting with powerlines. At the Berg River estuary in the Western Cape plastic balls more commonly used in the cisterns of toilets adapt very adequately, if somewhat inelegantly, as low voltage powerline markers where flamingo collisions are a problem. Social weavers in the Kalahari have been provided with decoy poles to attract them away from distribution lines that carry essential supplies to the farming community in the vicinity of Douglas.

Perhaps the culmination of the work of the BRC has been the publication of a document entitled "Guidelines for Dealing with Bird Problems on Transmission Lines and Towers". This summarises Escom's experience on the subject and offers advice to those confronted with similar problems. These guidelines are being widely promoted within the organization and requests for advice have been received from across the country's borders, including from Israel, Botswana and the Seychelles.

JOHN LEDGER

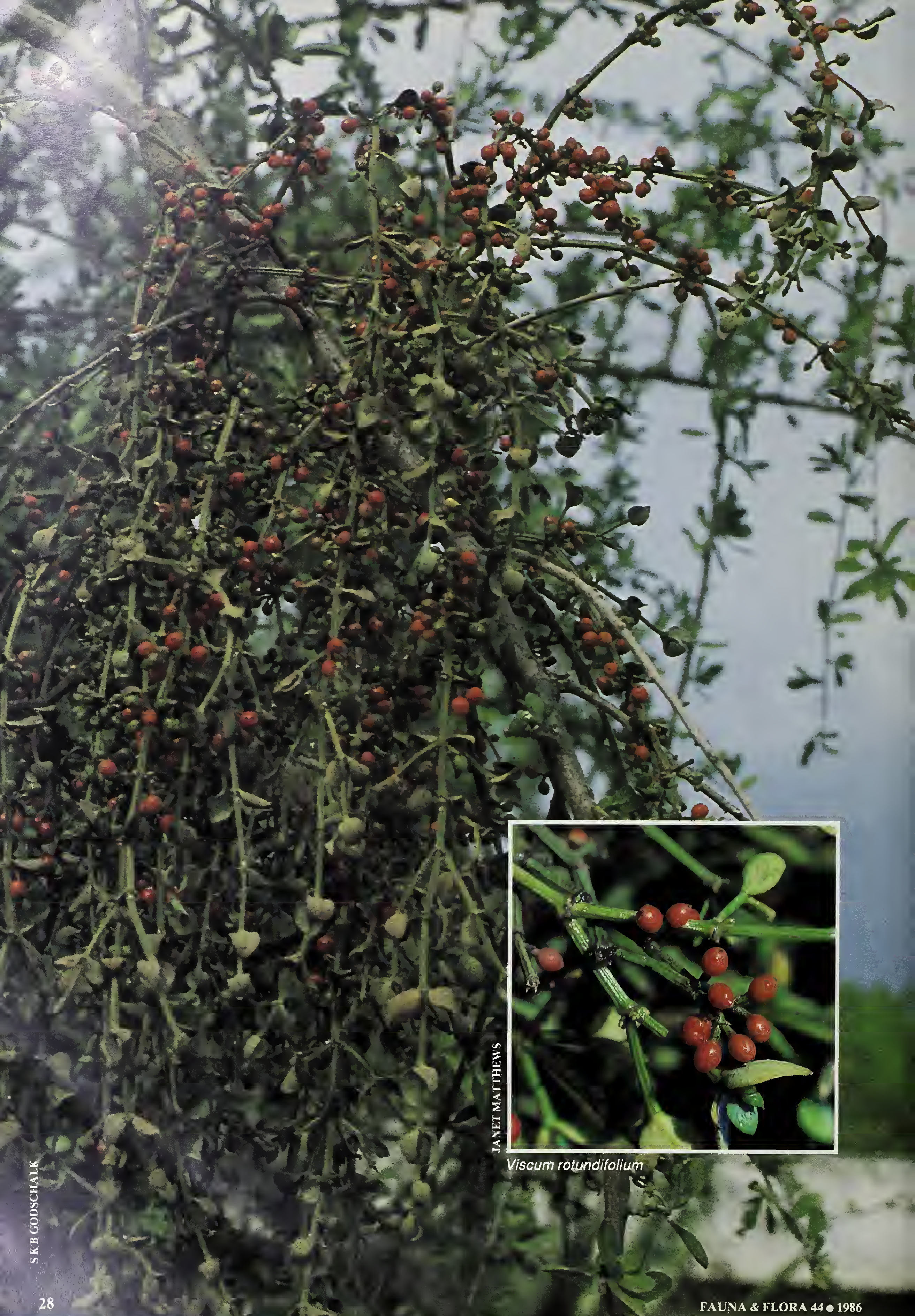
Collisions with powerlines sometimes cause death.

Such measures encourage personnel employed in the daily provision of electricity to appreciate the wider responsibilities they have for the environment in which they work. "Environment" is perhaps sometimes mistakenly regarded as something to be enjoyed at weekends and on public holidays only! Escom is ensuring that its staff is aware of its total dependence on our shared environment and their responsibility for it.

Technological development can thus be compatible with environmental conservation. The expense of reducing injury or mortality to birds serves the interests of Escom and its consumers as much as that of conservationists. After all, most of the readers of *Fauna & Flora* have a foot in both camps! Escom's Bird Research Committee represents a practical partnership of engineers, environmental scientists and planners, striving toward that "golden mean".

Scientific names of birds in text

bald ibis	*Geronticus calvus*
barbets	Family Capitonidae
black crow	*Corvus capensis*
black eagle	*Aquila verreauxii*
Cape sparrow	*Passer melanurus*
Cape vulture	*Gyps coprotheres*
ducks	Family Anatidae
egrets	Ardeidae
flamingos	Family Phoenicopteridae
geese	Family Anatidae
golden eagle	*Aquila chrysaetos*
great kestrel	*Falco rupicoloides*
guineafowl	*Numida meleagris*
herons	Ardeidae
ibis	Plataleidae
martial eagle	*Polemaetus bellicosus*
pied crow	*Corvus albus*
tawny eagle	*Aquila rapax*
social weaver	*Philetairus socius*
woodpeckers	Family Picidae



S K B GODSCHALK

JANET MATTHEWS

Viscum rotundifolium

S.K.B. Godschalk

TO PLANT A SEED ON A BRANCH

THE members of the plant families Loranthaceae and Viscaceae share a remarkable lifestyle. These half-parasitic mistletoe plants obtain their water and minerals from the vascular tissue of some or other woody plant. The organic nutrients are produced by photosynthesis and the plants thus have normal green leaves. Mistletoes occur all over the world, but are more fully represented in the tropics and subtropics. The family Loranthaceae consists of 65 genera and 900 species, the family Viscaceae of 7 genera and 450 species. It is thus a highly successful group, ascribable to this adaptation.

According to the latest classification, 54 species of mistletoe occur in Southern Africa. They exhibit great variation in geographic distribution and structure, from *Erianthemum dregei* in the coastal forests of Natal to *Tapinanthus oleifolius* in the dry Northern Cape and South West Africa; from the widely distributed *Viscum rotundifolium* to *Actinanthella wyliei* and *Helixanthera woodii* which are confined to the Ngoye Forest in Natal. The tiny *Viscum minimum* near Port Elizabeth consists of only one node. On the other hand, certain of the *Tapinanthus* and *Viscum* species grow to large shrubs. The Transvaal is home to 8 genera and 30 species. All mistletoes have one feature in common: they only grow on living branches of trees or other woody host plants.

Mistletoes have a "sticky" problem. Their seeds have to be transferred to a living branch of a suitable host plant by some means or another, to establish a new plant successfully. Seeds which end up on the ground, or on dead host branches, are totally lost for the reproduction of the species.

How does a mistletoe manage this transfer of seed through the air onto another host tree? There are several ways to achieve this. One group of mistletoe plants in North America have "exploding" seed capsules. When the capsule reaches maturity it explodes with some force and an audible crack, scattering seeds for several metres in all directions. If fortunate, a seed falls on a suitable host plant. Statistically the chances are sufficient to ensure reproduction of the species.

However, frugivorous birds are responsible for seed distribution in most mistletoe species. Practically each zoogeographical region has its own spectrum of bird species to accomplish this. The digestive systems of many of these birds are apparently specially adapted to a diet of mistletoe fruits. Most of these birds (outside Africa) pass the seed in their faeces. Many seeds fall on the ground and are thus lost. Some, however, fall on branches of suitable host plants where germination can take place, leading to a new mistletoe plant.

But what happens in Africa? Until recently, relatively little was known about the distribution of mistletoe seed on this continent. For this reason a research project to delve into the mysteries of the subject was initiated a few years ago. For fifteen months I stayed on the Loskop Dam Nature Reserve, collecting data and making observations. As the research progressed, many new and interesting facts came to light. I would like to share some of these with you.

It transpired that only one species, namely the yellow-fronted tinker barbet *Pogoniulus chrysoconus* is responsible for the distribution of between 64 per cent and 94 per cent of the seed of different mistletoe species. Other birds contributing to a lesser extent are mousebirds, the black-collared barbet *Lybius torquatus* and the pied barbet *L. leucomelas*, the black tit *Parus niger*, the plum-coloured starling *Cinnyricinclus leucogaster* and the red-headed weaver *Anaplectes rubriceps*, the last-named three species being unexpected. The most important single species, however, is the tinker barbet. These birds were seldom observed away from mistletoe plants and it appears that mistletoe fruits are their staple diet. This conclusion agrees with data from other parts of Africa.

How the tinker barbet handles the seed is another interesting fact that came to light. The bird takes the fruit in its bill, squeezes it until the skin bursts open, swallows the seed with its fleshy covering layer and drops the skin.

Before continuing, let us look briefly at the structure of the mistletoe fruit. The seed is covered with a very sticky *viscin* layer. Around this is situated a fleshy layer which the birds are very fond of.

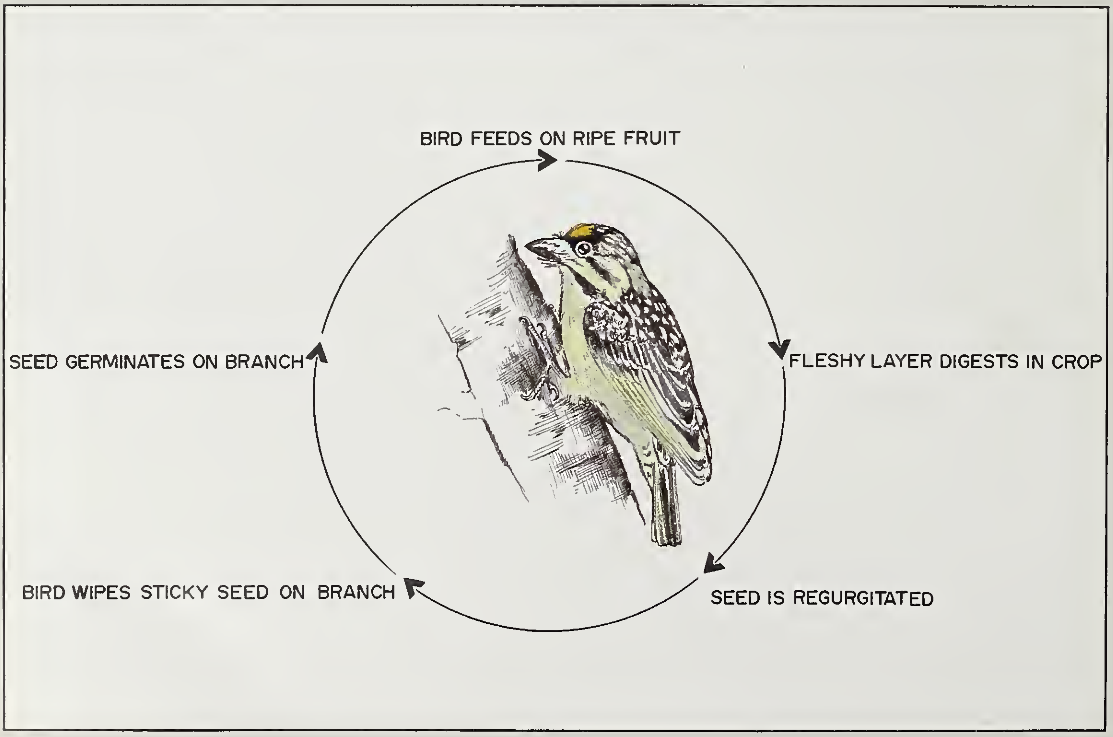
The tinker barbet will not eat more than three of the larger fruits or five of the smaller fruits. It then flies off and perches on another branch, or stays perched on the branch where it has fed. After a very short while (from 20 to 60 seconds, depending on the size of the fruits) it starts regurgitating the seeds. It appears that the fleshy layer of the fruit has been removed in the bird's stomach and is utilised as food. At this stage the viscin layer is extremely sticky. The bird wipes the seeds off its bill onto the branch, where they remain stuck. The time elapsed from the moment that the bird eats the first fruit (of say three fruits) in a meal until it regurgitates and plants the last seed is no longer than one or two minutes. Such quick handling of mistletoe fruit has never been recorded before. It was found that smaller fruits are handled more rapidly than larger fruits. That this handling of fruit and seed is highly successful is borne out by the fact that in more than a thousand observations only one seed fell off the branch. The others were all securely stuck.

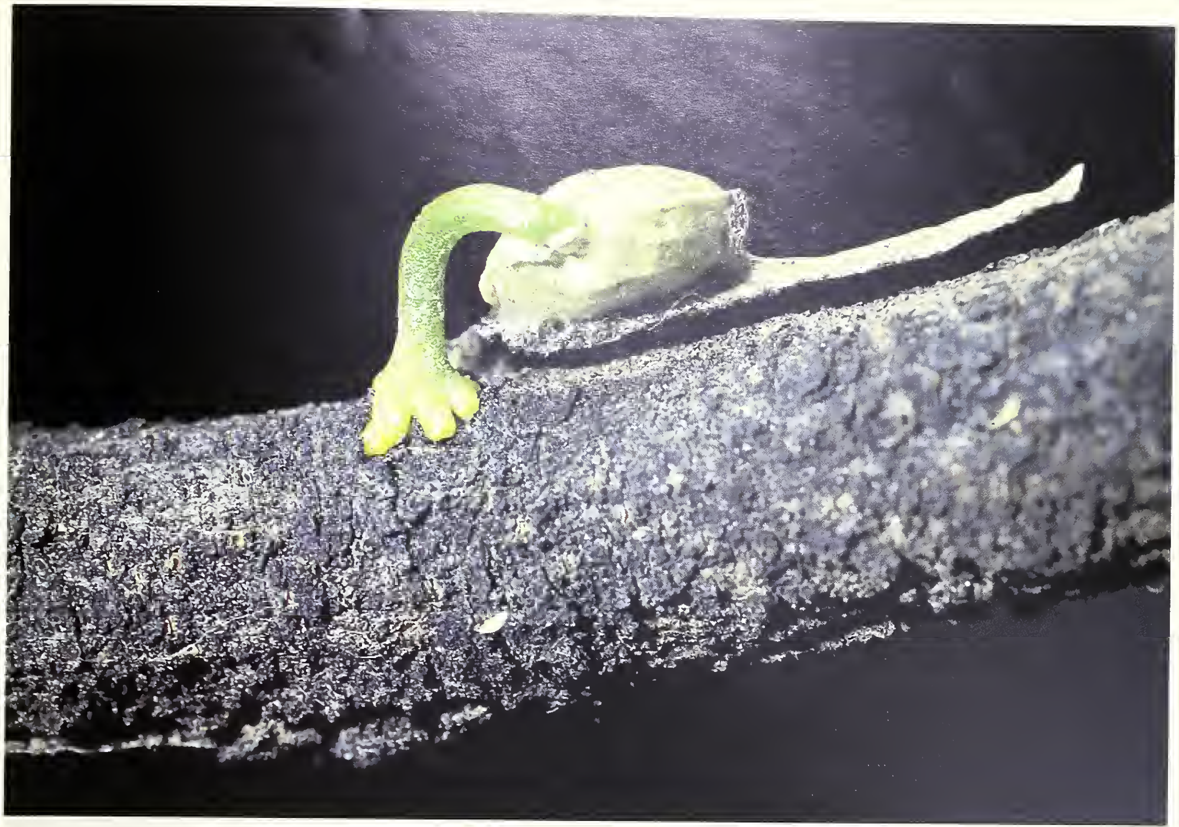
The barbet and the plum-coloured starling handle the seeds in a manner similar to the tinker barbet. Mousebirds pass the seeds in the faeces. The black tit and the red-headed weaver exhibit a unique technique. The bird plucks the fruit off the plant and squeezes it until the skin bursts open. It then places the contents on the branch and drops the skin. It holds the seed in position with one foot, pecking small pieces off the fleshy layer. Having removed enough, it leaves the seed stuck on the branch by means of the viscin layer. This behaviour has never before been recorded for these bird species.

Does mistletoe fruit contain sufficient food value to form the staple diet of tinker barbets? To try and answer that question, the fleshy layer of *Tapinanthus leendertziae* was analyzed biochemically. The results are summarized in the table.

Item	*Average*
Fresh mass	78,70 mg
Energy content	25,73 kJ/g
Moisture	75,2%
Protein	9,1%
Fat	34,7%
N-free extract	47,9%
Crude fibre	7,7%
Ash	0,6%

Biochemical composition of the fleshy layer of the fruit of *Tapinanthus leendertziae*.


BIRD FEEDS ON RIPE FRUIT
FLESHY LAYER DIGESTS IN CROP
SEED IS REGURGITATED
BIRD WIPES STICKY SEED ON BRANCH
SEED GERMINATES ON BRANCH


JANET MATTHEWS

Germination of a Viscum seed on an acacia branch (magnification ±5×).

It thus appears that mistletoe fruits have a high fat content and thus a high energy content. They also have a reasonably high protein content which is supplemented by eating insects. If a tinker barbet ate only mistletoe fruits, a single individual would theoretically have to eat 172 fruits of *Tapinanthus leendertziae* to satisfy its energy requirements. In the light of its rapid treatment of the fruits, this is quite feasible. At the same time the bird would ingest nearly its own weight in water from this number of fruits.

Many people are under the impression that a mistletoe seed has to pass through the digestive tract of a bird before it can germinate. This view was refuted during the study. The very short time that the seed spends in the bird's stomach already makes it seem improbable. In addition, fruits were regularly encountered in the field which had germinated without ever being eaten by a bird! Lastly, germination tests where carried out on seeds which had passed through with the faeces and seeds which had never been eaten by a bird. There were no differences in germination rate.

Certain mistletoe species are highly host-specific and are only found on a single or a few tree species. This poses the interesting question as to whether the distribution agent plays a role in this specificity. It however appears not to be the case. The same bird species, namely the yellow-fronted tinker barbet, was found to be the distribution agent for *Viscum combreticola* which mainly occurs on *Combretum* trees and also for *Tapinanthus leendertziae* which is found on a wide variety of host trees. These two species bear fruit at the same time of the year and this is then eaten at random by the birds. It thus appears as if only plant physiological factors, and not the distribution agent, play the main role.

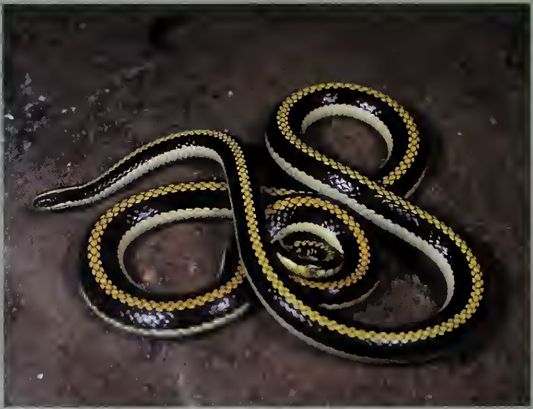
From available data it appears conclusive that tinker barbets, where they occur in Africa, are the main distributors of mistletoe seeds. However, there are regions where mistletoes are found but no tinker barbets. In Southern Africa it includes the Orange Free State, the Cape Province west of 25° east and the largest parts of Botswana and South West Africa except the northernmost regions. Here other bird species are responsible for seed distribution, although very little specific data are available. Birds from these areas that have been observed eating mistletoe fruits include the Knysna Lourie *Tauraco corythaix*, the Cape bulbul *Pycnonotus capensis* and the sombre bulbul *Andropadus importunus*. Undoubtedly several other species also eat mistletoe fruits, for example mousebirds and the pied barbet.

Birds do not only play a role in the distribution of mistletoe seeds but are also vital in another phase of the reproduction process in *Loranthus* mistletoe species, namely the pollination of the flowers. But that is a story on its own.

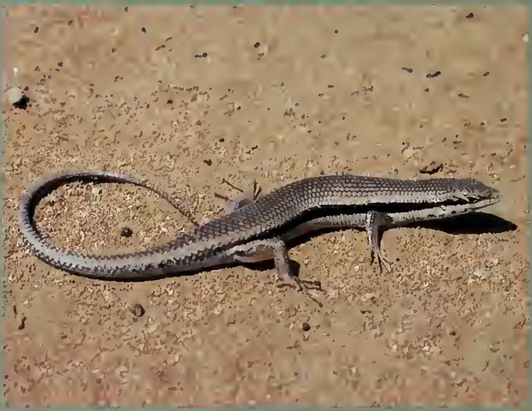
Rare Reptiles of the Transvaal

THERE are 186 different kinds of reptiles (eight tortoises and terrapins, 87 lizards, eight worm-lizards, 82 snakes and one crocodile) which occur in the Transvaal. Quite a number of these can be classified as rare, in the sense that they are seldom seen, even though they are fairly widespread and in fact not uncommon at all. The reason for this is that they are either fossorial, nocturnal or live in places such as high mountain tops and cliff faces so that few people ever manage to capture or sight these animals to record their existence. Other species are rare in the sense that they are very localised in distribution. In other words their requirements are rather particular and only fulfilled in very specific habitats. These habitats may be very limited, for example montane forests or, where the habitat was once abundant, is now very scarce due to factors such as drought, flooding, pollution or man's encroachment. Although these species are very localised they may be fairly common within their specific chosen environments.

The crocodile is an animal which, because of stiff competition from man, is becoming rare outside the conservation areas in the Transvaal. Because of the skin trade, the need for muti and curios, certain species are becoming increasingly rare even though the habitat is still available. Then there are those animals which are rare in the Transvaal simply because their distributional ranges just reach to within our boundaries. These species can be, and often are, common outside the province. Finally there are those animals which are genuinely rare in the true sense of the word. They are very seldom encountered even by people who make concerted efforts to find them. The reasons for this rarity remain obscure and fortunately there are very few species which fit into this category. So the next time you encounter a snake, don't kill it. You may be looking at a rare animal which many a herpetologist, working the field for many a year, has never even had the privilege of seeing.


N H G JACOBSEN

Homoroselaps dorsalis
A very secretive, small snake which is fond of sheltering in disused termitaria on the Transvaal Highveld.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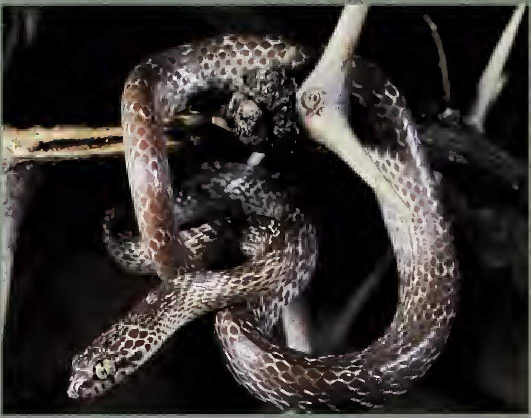
Mabuya homalocephala depressa
A species which is very localised in the Transvaal. It lives in areas with deep sandy soils in Vendaland, the north-eastern Nyandu sandveld and the Pumbe sandveld of the Kruger National Park.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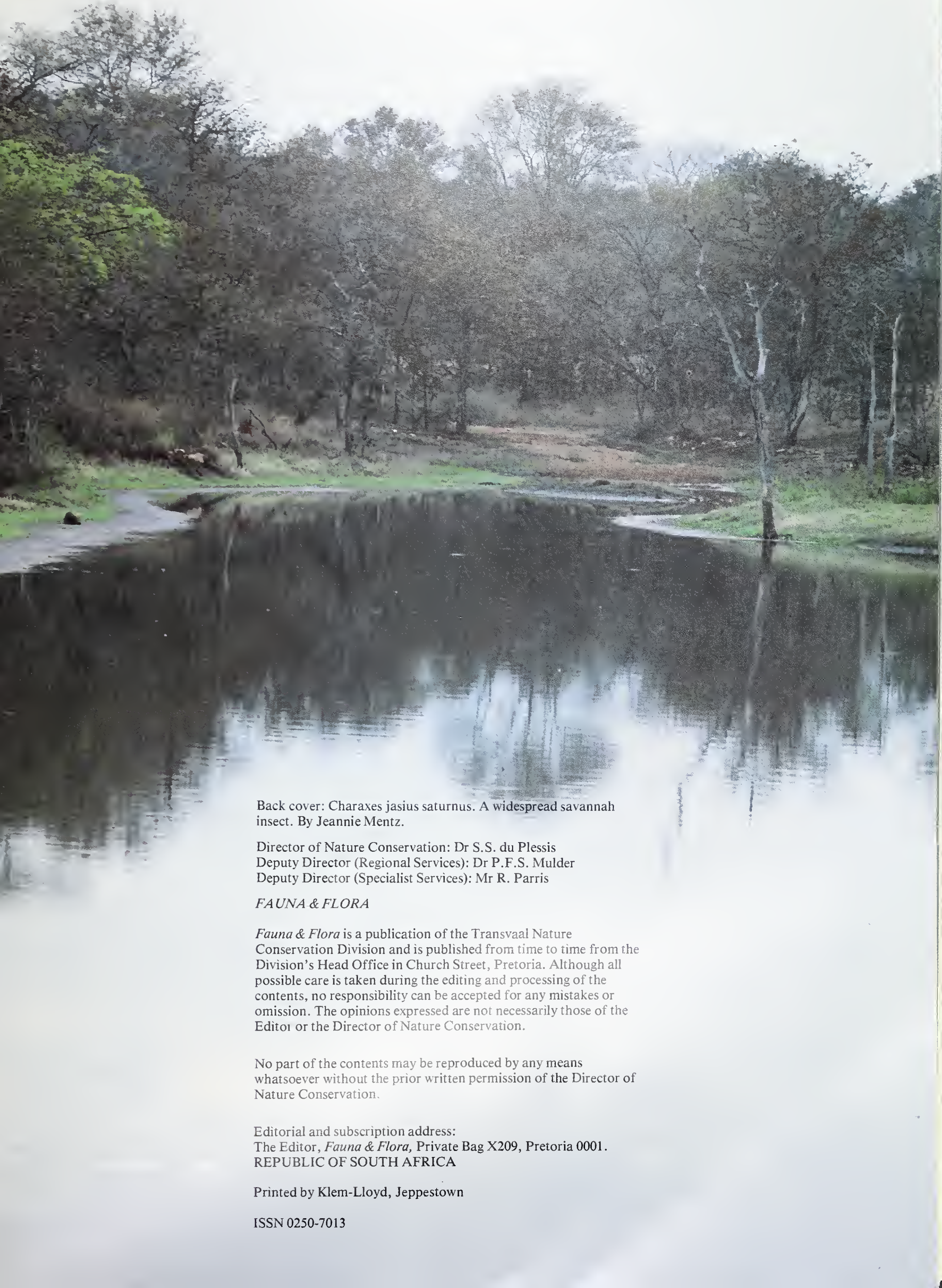
Dipsadoboa aulica aulica
A very secretive, nocturnal species of snake which is seldom encountered. Not much is known at all concerning its ecology.



Back cover: Charaxes jasius saturnus. A widespread savannah insect. By Jeannie Mentz.

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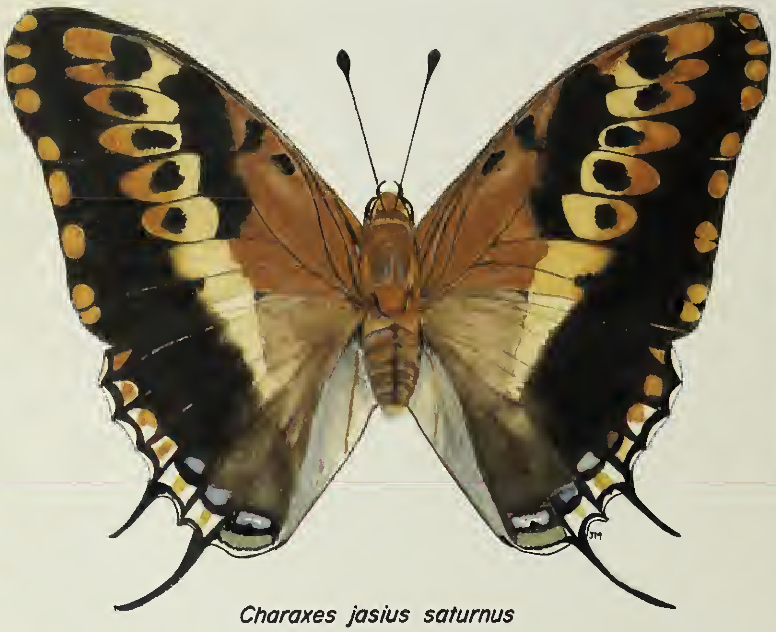

Charaxes jasius saturnus

Fauna & Flora

Transvaal Nature Conservation Division

Number 45

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STRATION SEARCH
OF A SUPPLY

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NUMBER 45 1987

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Front cover:

THE Dwarf Bittern is one of the smallest members of the heron family, being only 30 cm long and about the size of a pigeon. One of the most striking features of the bitterns, including the Dwarf Bittern, is the behaviour of concealing himself by adopting a rigid pose with his neck stretched, his bill pointing upwards and his body feathers flattened against his sides to make himself as thin as possible: its striped chest and neck enables the bird to match its surroundings.

Dwarf Bitterns are summer migrants to the Nyl, coming here to breed from tropical Africa. They arrive within a few days of flooding occurring and males call from nest sites to attract females, making a muffled barking "rho-rho-rho" sound. Once mating has taken place and egg-laying commences, calling ceases and the birds become much less conspicuous. Both sexes share incubation and caring for the young which hatch after two and a half weeks. The young are active from an early age and will wander from the nest when only a week old, returning when their parents arrive, to be fed.

The Nyl floodplain is the only locality in South Africa where the Dwarf Bittern is known to breed regularly, and small numbers find their way here every year in which flooding occurs. How they know that there has been flooding and arrive so promptly, remains a mystery.

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WARWICK TARBOTON

JANET MATTHEWS

Warwick Tarboton, the author of this issue, has lived on the Nyl Floodplain for 13 years and has seen it in all its phases.

NYL FLOODPLAIN

THE lack of water is rapidly restricting growth in South Africa. During these times of drought no one needs to be reminded of this, least of all those people in towns and cities rationed to using their garden hoses for only a few hours each week. The available water in the land is being increasingly managed — stored in dams, stored in old mines, pumped from one catchment to another and even bought and sold like other commodities across international borders. Rivers that once flowed all year in the Kruger National Park now dry up in winter as the water in their catchments is siphoned off for multitude other purposes. Natural systems, such as the galleries of majestic old riverine trees along the Lowveld rivers, are invariably the victims. The trend away from letting water do its own thing, like spilling out on to floodplains and evaporating away, is accelerating.

In the centre of the Transvaal, about 150 km north of Pretoria, there still exists an aquatic system that, for the most part, is left to do its own thing. It is the floodplain of the Nyl River. The water it draws from a tiny catchment in the surrounding hills spills out on to the adjacent flats and sparks off a chain of life unparalleled in South Africa. In the hot bushveld sun the water doesn't last forever and, as it evaporates, so the web of life shrinks away and makes alternative arrangements until the next floods. This issue of ***Fauna & Flora*** is devoted to the Nyl floodplain and its surroundings. As you will see the surroundings feature as much as the floodplain itself. Some of the research being conducted at Nylsvley and elsewhere in the area is described and some of the interesting and often intricate processes occurring within the web of life in the region are sketched. Without the Nyl, however, the surrounding country would be little different from much of the bushveld or savanna that clothes the northern half of the Transvaal; it is this feature that makes this area special.

The Nyl floodplain is under threat. Who could look at it in a flood year without thinking of alternative uses for all that water evaporating away? As long ago as the 1920s calculations were made as to how the flood water could be siphoned off for use on the Springbok Flats. In the 1960s a hydrological study was made to see if the flood water could be channelled underground to recharge the aquifers in its basin depleted by overpumping in the past; at other times a canal has been mooted to trap the floodwater before it spills onto the floodplain, for use in the population growth points around Potgietersrus. The Nyl system could so easily be irreversibly destroyed by cutting off its flood water. One impoundment like the Donkerpoort Dam in its tiny catchment effectively reduces the run-off from this tributary by a third. A few more dams of this size along this or other major feeders to the floodplain would be its death-knell. So often beautiful and unique natural systems fall fictim to development that destroy natural systems and yet do not fulfil their intended purposes. Before decision-makers throw away the jewel that is the Nyl by initiating developments that will irreversibly damage this system, they must weigh up the losses against the gains and take the consequences of their decision; this ***Fauna & Flora*** highlights some of the losses which could be expected.

DR P.F.S. MULDER
DIRECTOR OF NATURE CONSERVATION

JANET MATTHEWS

— A bird's eye view —

NOTHING offers one a better introduction to the Nyl and its surroundings, than a left window seat on the morning flight from Jan Smuts to Nairobi: in air-conditioned comfort 11 000 m up, the four features of the region can be encompassed at a glance. First there is the isolated, flat-topped inselberg marking the start of the floodplain and which tells pilots where they are. Stretching away from it into the hazy east is a flat, featureless plain chequered with a patchwork quilt of tiny red, brown, black and green fields; to the west rises a knobbly plateau, furrowed and creased and wrinkled where it abuts on to the flats, and, finally, spewing out of these hills are the threads of streams which coalesce into a green swath that widens as it snakes its way across the western edge of the flats. The spectacle lasts for a few minutes before being swept away by another kaleidoscope of images. The four features, if you could recognise them, are Kranskop, the Springbok Flats, the Waterberg and the Nyl River floodplain and they set the stage for the variety show that follows.

WARWICK TARBOTON

The Springbok Flats lie at an elevation of 1 050 to 1 100 m above sea-level and extend over 8 000 km². They are remarkably flat, due mainly to the horizontal disposition of the basaltic lavas which underly them. There are no well-defined drainage lines dissecting them and in some places one cannot even predict which way rain-water is likely to flow. The soils derived from the basalt are heavy, nutrient-rich clays, commonly called 'black turfs'. They easily become waterlogged during the rains and retain their moisture for a long period thereafter; rock outcrops are virtually non-existent.

In prehistoric times the Springbok Flats were the larder of the Bushmen and their Stone Age forerunners: the presence of thousands upon thousands of stone artefacts littering the turf soils attests to this. The teeming herds of game of those times have disappeared without trace. The last springbok herds which gave rise to the Flats' name vanished in the 1920s. Today the Flats are one of South Africa's more important granaries. More than 90% of the original vegetation has given way to agriculture, and lands of wheat, sorghum, sunflower, manna and maize stretch from horizon to horizon. Tractors plough six abreast; the drone of aircraft by day marks the spraying of crop pests and, by night, the extermination of quelea colonies. In a few places where the ground is too wet to plough, pocket handkerchief-sized fragments of the original plant communities of the region still occur — scattered acacias, especially *Acacia tortilis, A. nilotica* and *A. fleckii,* underlain by a dense field layer of grasses including one species — *Sehima galpinii* — which is endemic to the Springbok Flats.

Along the western edge of the Flats rise the first hills of the Waterberg Plateau. The underlying basalt here gives way to more weather-resistant rock types, principally sandstone and felsite which form a series of long ridges or scarps running from the north-east to the south-west. The first of these is the long scarp running parallel to and just west of the national road to Naboomspruit: it marks a large fault-line along which the Waterberg sediments have been thrust up by 120 m against the more recent Karoo rocks. More ridges follow further west, culminating in the frowning brow of cliffs which form the impressive Sandrivier Mountains where elevations reach 1 750 m.

WARWICK TARBOTON

The Waterberg receives somewhat more rain than the Flats — up to 700 mm per annum fall in places here, whereas on the Flats the average is about 600 mm. The vegetation on these rocky hills is called 'Mixed Bushveld' or 'Sourish Mixed Bushveld', the first comprising a variety of broad-leaved deciduous tree species and the second having a simpler woody community of *Faurea saligna, Acacia caffra, Protea caffra,* the Transvaal milkplum *Bequaertiodendron magalismontanum* and a few others. This is primarily cattle-ranching country. In parts of the Nyl catchment the rivers have formed deeply incised kloofs — a good example is the one on the farm Naauwpoort, visible from the tortuous road up to the mineral baths from Nylstroom. In these kloofs vestiges of forest-type vegetation are found with tree species more typical of the escarpment forests of the Eastern Transvaal: yellowwood *Podocarpus latifolius,* bladder-nut *Diospyros whyteana,* cheesewood *Pittosporum viridiflorum,* Kei-apple *Dovyalis caffra,* Cape holly *Ilex mitis* and tree fuchsia *Halleria lucida.* Some of these forest fragments support small, isolated populations of forest bird species like the Cape Batis and Terrestrial Bulbul which must have colonised the area when the forest habitat was more extensive. An interesting study made of the pollen deposits in a mineral spring ('Wonderkrater') on the farm Driefontein, near Naboomspruit, has indicated that during the past 35 000 years there have been at least three cool, wet eras in which yellowwood forests extensively covered parts of the Waterberg. Between these wet cycles were periods when a drier and/or hotter climate prevailed and during these times the forests receded and gave way to xeric vegetation. The pollen evidence also suggests that the plant communities found here today probably originated about 1 000 years ago when the most recent swing from a cool, wet period to the warmer, drier climate which prevails today, occurred.

Kranskop stands isolated, about 3 km from the nearest adjacent part of the Waterberg, in the broad alluvial basin of the Nyl River. It rises 250 m above the plain and reaches an elevation of 1 388 m, and it offers a good cross-sectional view of the beds of purple and brown sandstones and the coarse, jasper-pebbled conglomerates that characterise the rocks of the Waterberg Group. Geologically it is also of interest because it lies in the trough of the Nylstroom syncline and is a tiny residual fragment of a formation (the Skilpadkop Formation) found much higher up in the Waterberg succession and which outcrops in a long line at the foot of the Sandrivier Mountains. There are many other interesting features about Kranskop which make it well worth the climb. In October, for example, its northern upper slope is ablaze with the spectacle of the paperbark false-thorns, *Albizia tanganyicensis,* with their cream-coloured smooth stems, their translucent flaking bark and their large clusters of pale yellow blossoms.

The last lingering image from the 747's window is the valley of the Nyl. "This is without doubt one of the most remarkable features of the area" wrote Dr. Wagner, the government geologist who mapped the area in 1927. In its upper reaches it behaves as an ordinary river but further down on the floodplain "it loses all semblance to an ordinary river valley. It is barely perceptibly incised below the level of the surrounding country, and it is thus impossible to say where it begins and where it ends. At the same time clumps of trees and scrub make their appearance, thereby increasing its lack of definition. There is no longer any well-marked watercourse, this being replaced by a succession of marshes, except after heavy rains when nearly the whole of the vlei is transformed into an enormous sheet of sluggishly moving shallow water". Wagner's graphic description still fits 60 years later.

The floodplain starts to widen at the western edge of Nylsvley Nature Reserve and it attains its greatest width of five to six kilometres on the farms downstream from here — Vogelfontein, Weltevreden, Zyferkraal, Du Toits Kraal (the last three embraced by the Mosdene Private Nature Reserve), Groenvaley and Zandpan. In total the floodplain extends for nearly 70 km and covers an area of 16 000 ha. At its northern end, on the farm Vaalkop, it narrows and assumes the character of a normal river and from Moorddrift northwards it is known by the name of Mokgalakwena.

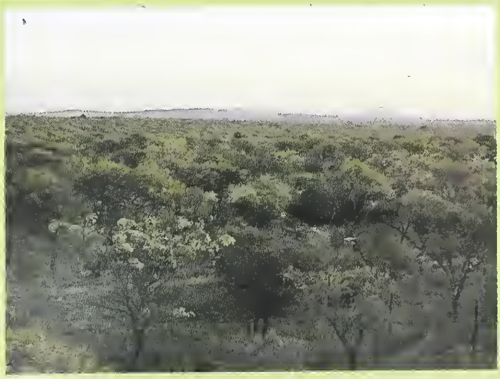
JANET MATTHEWS

An example of a typical kloof which occurs in this vicinity with forest type vegetation such as yellowwood *Podocarpus latifolius*, bladder-nut *Diospyros whyteana*, cheesewood *Pittosporum viridiflorum*, kei-apple *Dovyalis caffra*, Cape holly *Ilex mitis*.

Wagner ascribed the formation of the floodplain primarily to the faulting, mentioned earlier, which runs west of Naboomspruit. He assumes that before faulting the river took more or less the same course it has today. The Naboomspruit fault led to the gradual subsidence of the Karoo rocks underlying the Nyl which, in its middle reaches was opposite the position where the widest throw of the fault occurred. This led to a basin-type structure developing here with a reduced flow-rate and deposition of alluvium occurring. The Nyl's gradient was further reduced at two places where it encountered the harder Waterberg sediments underlying the Karoo rocks: these had a damming effect and led to further deposition of alluvium on their upstream sides. One of these 'dams' is on the farm Deelkraal where the river has cut into the sandstone forming the nose of the Nylstroom syncline and the other is at Vaalkop where the river has stripped through the basalt and encountered weather-resistant norite below. There have been some slightly different interpretations to Wagner's; for example, that the Nyl originally drained eastwards into the Olifants River and that it was 'captured' by the Mokgalakwena at Vaalkop as a result of the latter eroding back its head-waters to this point. But the effect of the Naboomspruit fault on the formation of the floodplain is not in dispute and it is this quirk of fate that has led to the remarkable occurrence we see today.

WARWICK TARBOTON

On these rocky hills we find a variety of broad-leaved deciduous tree species including *Acacia caffra, Protea caffra, Bequaertiodendron* and a few others.



WARWICK TARBOTON

Kranskop reaches an elevation of 1 388 m and it offers a good cross-sectional view of the beds of purple and brown sandstones and the coarse jasper-pebbled conglomerates that characterise the rocks of the Waterberg Group.

What's in a name?

THERE is an engaging story about how the Nyl River got its name. It dates back to Thomas Baines, an early explorer in the interior of South Africa who travelled in these parts in 1871 when Nylstroom was a five-year-old village, and a Mr Collins ran the only store there. Baines recounts that this river, known to the local Africans as Mokgalakwena (meaning 'fierce crocodile'), was mistakenly thought to have been the real Nile by a group of religious zealots known as the Jerusalemgangers, who were heading north across Africa for the Holy Land. Historians have embroidered on the tale, adding the presence of 'fierce crocodiles' to the evidence that it was the Nile, and suggesting that Kranskop, which marks the beginning of the floodplain, was mistaken by these trekkers for the ruins of an Egyptian pyramid.

But on a closer scrutiny of the movements of the Jerusalemgangers and of other events in the Transvaal, one finds that this story sags a little. We know that long before 1837 there were Voortrekker groups moving back and forth across the central Transvaal and that two families settled a stone's throw from Kranskop in 1837. There is no doubt that they would have been aware of the marshland that lay on its eastern side. In 1837 the Jerusalemgangers were still in the Eastern Cape. They left the Cape in that year to escape British rule and were led by a fiery character called Johan Adam Enslin whom another early explorer, J. Chapman, described thus: "(he) bears a bad name as headstrong, self-willed and having queer political and scriptorial ideas of his own . . . (he) has made many ignorant people believe he is inspired". Enslin took his flock as far north as Marico where, in 1848, they settled and farmed, awaiting a vision to appear and lead them northwards to the Holy Land. During this wait Enslin waged verbal war on neighbouring African chiefs, on other trekker leaders and on the Volksraad in Potchefstroom. His clash, for example, with leader Hendrik Potgieter led to a court case in 1851, as a result of which Enslin was jailed.

In 1852 the Marico district was struck by a malaria epidemic and Enslin, then 52 years old, was amongst its victims. This was not the vision which the Jerusalemgangers had been anticipating and Enslin's death led to their dissolution. Most of the surviving families fled from Marico and settled in other parts of the Transvaal. The farm Tweefontein, near Nylstroom, came into the hands of one of these families then, as did the farm at the source of the Nyl, 'De Nyl Zyn Oog'. As shown, though, these families settled here not long before the establishment of the village of Nylstroom and at a time when there were probably many families living in the area. It is thus impossible that the Nyl was named by the Jerusalemgangers on their Holy Land pilgrimage. Most likely it was simply a figurative name given to the marshy river in the same way that Amsterdam, Bethlehem, Belfast and a host of other places in South Africa came by their names and it could have been so named by any one of many early Voortrekker groups.

Waterbergen

Hessie se water

Kranskop

Days gone by . . . . .

INTEREST in the prehistory of the area surrounding the Nyl was sparked off by ecologists working at Nylsvley who were looking for an explanation for the presence of isolated patches of *Acacia* trees growing in sandveld where broad-leaved woodland is normally found. On aerial photographs these show up as irregularly spaced, circular clearings up to a few hundred metres in diameter, some encircled by large marula trees and all covered with *Acacia tortilis* and other species not otherwise found growing in sandy soils. Did these acacia areas, and particularly the soils supporting them, originate from natural geomorphological processes, or were they manmade? (The question has not yet been resolved. Archaeologists favour the hypothesis that man caused the acacia patches through enriching the soil at these places with his debris (phosphate from bones and so on), geomorphologists say that man was attracted to these already enriched sites (which were caused by eluviation) and he merely maintained the process of enrichment.) The archaeological investigation that resulted from posing this question led to some interesting findings. The acacia sites were found to be littered with the artefacts of early man and they had clearly seen human occupation for a very long time. The earliest hominids in the area, first nomadic bands of Stone Age man, and later the Bushmen, left large numbers of stone implements but very little else, except, in a few places where there are sandstone shelters (Witkop, Klipputgat), simple paintings. Later settlers left pottery and bone fragments and even a human skeleton or two: radio-carbon dating of the pottery indicates that there were two different occupations, the first in 800-1100 AD and the second in 1300 AD. The more recent of these settlers owned cattle, had permanent villages and decorated their pottery in the traditions of the late Iron-Age Makoros.

The early 1800s saw the first white travellers in the interior of the Transvaal, but it was not until 1837, when the Matabeles were defeated, that the way was opened for white settlers and there was a large-scale movement of Voortrekker families into what became the Trans-vaal Republic. The first known settlers in the vicinity of the Nyl were two families, Van Rensburg and Van der Merwe, who moved on to the farm Tweefontein, lying between Nylstroom and Warmbaths, in 1837. The railway siding on this farm is now called Eersbewoond to mark the event. The nearby hot springs where Warmbaths now lies, were well known in the early days although there was no settlement there until 1882; Andries Pretorius is recorded as having left his wife there to recuperate from malaria when he went to the Orange Free State in 1848 to negotiate with the British.

In those pioneering days white settlements, and the necessities of life that could be bought at them were widely separated. Potchefstroom was the Transvaal's first town, established in 1838, and it was through here that all interior-bound treks passed. Ohrigstad was established a few years later (1845) and then Schoemansdal, west of Louis Trichardt, in 1855. The first white settlement along the Nyl was at the site of the present-day Potgietersrus, then called Makapanspoort, dating back to 1852. Near the same

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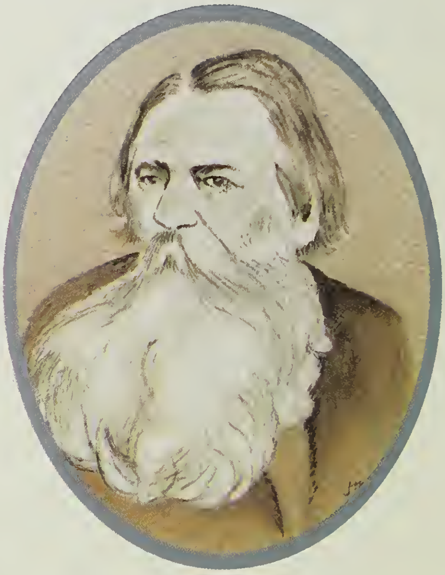
spot, where the present national road crosses the Nyl, there is a memorial marking the place where Andries Potgieter's son Pieter was ambushed and flayed alive by the African chieftain Makapan. It is inscribed as follows: "Ter herinnering aan 33 Voortrekkers wat in 1854 deur Makapan op verraderlike wyse vermoor is".

Many trekkers died young. In addition to hostile tribes and wild animals, malaria (then known as 'the fever') must have ranked high among the hazards facing settlers. Whole families were struck down and many died in epidemic years. Because of malaria Makapanspoort was abandoned in 1870 and not resettled for another 20 years. The real cause of malaria was not known in the 1800s — it was thought to result from breathing bad air in low-lying marshy places and there were no known antidotes or cures. In years with exceptionally high rainfall the incidence of malaria along the Nyl must have been extremely high.


Thomas Baines

The village of Nylstroom was established in 1866 on the farm Rietvlei to serve as an administrative-cum-postal base between Pretoria and the Northern Transvaal settlement at Schoemansdal. It was bought from an English trader/transporter named Ernest Olferman Collins who put up a house and shop close to where the present national road crosses the Klein Nyl. Nylstroom was never entirely abandoned in the malaria epidemic years, although its population was sometimes reduced to only one or two families. The founding of Nylstroom stimulated further settlement in the area and in the late 1860s farms like Donkerpoort and Vyeboomspoort sold for £25, or the price of two good horses. The Berlin Mission Station, where Pieter Potgieter's remains are reportedly buried, was built 10 km north of the town in 1867 and its ruins are visible through the trees just west of the national road.

The names of farms in the area offer a glimpse of what game species, now long gone, must once have been found here: Leeudoorns, Leeukuil, Renosterfontein, Buffelspoort, Buffelsdoorn, Buffelshoek, Buffelsfontein, Olifantspoort, Olifantsklip. In 1871 the explorer Thomas Baines climbed to the top of Kranskop and reported finding the skeleton of a rhinoceros on its crown. He failed to mention seeing vultures there, but it is likely that the whitewashed south-eastern face used nowadays by vultures was used in those days as well.

Kranskop was reputedly a sacrificial mountain for the Africans living in the area before white settlement. Its African name 'modimolle' means 'the place of the spirits'; alternatively it has been interpreted as 'modimo olle' meaning 'the gods have eaten'. Victims taken during wars were first mutilated by witch-doctors and then thrown off the top. Whether this is true or merely another myth which this hill seems to inspire does not matter; the fact is there is an aura about this precipitous hill despite the increased accessibility given to it by the motorway that now carves a slice out of its side. A story about Kranskop is that it provided the inspiration for the Voortrekker Monument built outside Pretoria. The monument's architect, Gerard Moerdyk, owned the farm Modderkop just south of Nylstroom and from the stoep of his house there, the view of Kranskop lying 20 km to the north-east is strikingly similar to the profile of the monument. The claim for Kranskop is almost certainly a legend, but will no doubt live on in folklore.

Gerard Moerdyk

Andries Hendrik Potgieter

J.G. Strijdom

Eugene Marais

Eugene Marais, whose essays and poetry celebrated the Afrikaans language a half-century ago, spent eight years (1907-1915) of his life in the Waterberg overlooking the Nyl and he drew many of his images from his experiences here.

Marais' two best known behavioural studies, *'The Soul of the White Ant'* and *'The Soul of the Ape';* were made on the farm Rietfontein on which he lived. This was situated next to the Union Tin Mine west of Naboomspruit.

The name of a former Prime Minister of South Africa (1954-1958), J.G. Strijdom, is also associated with Nylstroom. Like Marais, he was not a born and bred Waterberger but moved here as a young man to make a career as an attorney. It is said that he had a great love of nature. Strijdom's colleague and law partner in Nylstroom, F.H. Odendaal, also became a well-known public figure and served for a time (1958-1962) as Administrator of the Transvaal.

A recurring theme in the historical accounts of white settlement of the Transvaal is the word 'malaria'. The story of its eradication from much of the country has been told elsewhere, but it is worth mentioning here that its eradication from the Nyl floodplain and surrounding flats in the early 1940s ushered in a change in life-style unappreciated by the generation living and farming in the area today. Malaria attacks are unheard of here today, bottles of quinine unknown, and no farms today are vacated in summer simply because of the mosquitoes. Mosquitoes, including the malaria vector *Anopheles gambiae,* are still present, and in vast numbers in wet years, but their lethal parasite *Plasmodium falciparum* no longer exists on the Nyl.

WARWICK TARBOTON

Water, water, everywhere . . .

OLD-TIMERS one talks to about the Nyl remember, without fail, that it used to be bigger, swampier, wetter or deeper in bygone days; that "the water used to come up to the horse's thighs" when you crossed it in the era before the present bridges existed. They also talk about how, once upon a time, the water used to 'run' out of the Waterberg: that it really was a 'water berg' then, with sparkling water tumbling out of every kloof. Is this all true, or is it simply the fickleness of memory playing games?

A scan through the rainfall records from the catchment of the Nyl (which date back to 1910) shows that the average annual rains have not diminished here in the past 75 years. What it also shows is that there have been years of above-average rain followed by years of below-average rain and that there is no predictable cycle to these fluctuations. There were, for example, droughts during 1910-1914, 1930-1936, 1961-1966 and another now in the 1980s. Eugene Marais made his study of termites *('The Soul of the White Ant')* during the first of these droughts and recorded that this period was the driest in living memory. Between these droughts came periods when above-average rains fell, with the 1970s being the most recent example of this in which virtually every year's rain was above average: in one memorable summer (1974/75) it was nearly 1 000 mm. Similar wet periods have occurred intermittently throughout the period in which rainfall records have been kept.

More than anything else the rainfall record shows that the concept of 'average rain' has not much meaning because there is very seldom a year in which an average amount of rain ever falls in the Waterberg. It is usually a case of feast or famine, with the average deviation from the norm being some 17%. It is, I think, this periodicity in the rainfall that accounts for the general view that the Waterberg and the Nyl were "wetter" in bygone days: living on the Nyl during one of the drought periods, when the floodplain is parched, and the dusty, snake-like cattle tracks are etched deeply into the bare earth, it is hard to believe that the same plain can be transformed into a verdant green marshland with cool, tea-coloured water standing a metre deep over thousands of hectares. Similarly, in the wet times, when the chorus of frogs at night is so deafening that one can hardly sleep, the mosquitoes are almost intolerable, and the night skies are pierced by the whistling of the passing flocks of Whitefaced Ducks, one can barely conceive that this wet paradise can ever be transformed into an arid dust bowl.

The verdict, then, is that it is memory's fickleness that says the Waterberg used to be wetter. It is the penduluming of the system back and forth from one extreme to another that accounts for the enormous richness of the system in the wet years and for its resultant uniqueness.

All water reaching the floodplain comes from rain: the more rain that falls, the more flooding occurs —

LORNA STANTON

it is a simple and direct relationship. Ten rivers and streams carry the water off the catchment and on to the floodplain. Some of these, like Tobias Spruit and Andries Spruit, enter the Nyl at its lower end and so do not contribute in any measure to flooding. It is, in fact, left to a handful of rivers draining off the Waterberg around Nylstroom to determine if, and to what extent, flooding occurs each year. Their combined catchment (about 600 km²) is minute when compared with catchments of some of South Africa's larger rivers, but their effect in high-rainfall years is spectacular and enough to create a wetland system unparalleled in the country. The amount of rain actually falling on the floodplain itself would never be sufficient to inundate it. It needs the run-off which these feeders provide; take away this run-off and the wetland would cease to exist.

The floodplain has been inundated with water 10 times in the past 25 years: about 16 000 ha are flooded in the wettest years but only half this area in years of moderate flooding. When several years in succession have above-average (such as occurred in 1973-1976 when +25%, +48% and +21% of rain fell in the catchment) the floodplain remains inundated for up to four years. In other flood years it tends to dry out during the following winter. In seven of the 25 years no flooding occurred at all, and in the remainder there was brief, unsustained flooding which rapidly dried out. So, based on the past 25 years' experience, one can expect flooding, on average, once every two or three years. In practice, floods, like drought periods, are clumped together.

Flooding typically needs good rains, 150 mm or more, over a short period, say within a month. This triggers off a surge of water which moves slowly down the floodplain, inundating areas as it advances. Its timing is obviously dependent on the timing of the rain and the size of the area flooded is dependent on how much rain follows. Usually flooding take place in late December or January, but it has occurred as late as mid-March and as early as November. This initial surge of flood-water can dry up rapidly if there is no follow-up rain, or it could persist through to the next summer if above-average rains continue to fall. At least 10% above average rain is needed to inundate the floodplain; in terms of volume this amounts to more than 25 million cubic metres of water which is about ten times the capacity of Donkerpoort Dam, or five times the annual requirements of Nylstroom, the town supplied by this dam.

WARWICK TARBOTON

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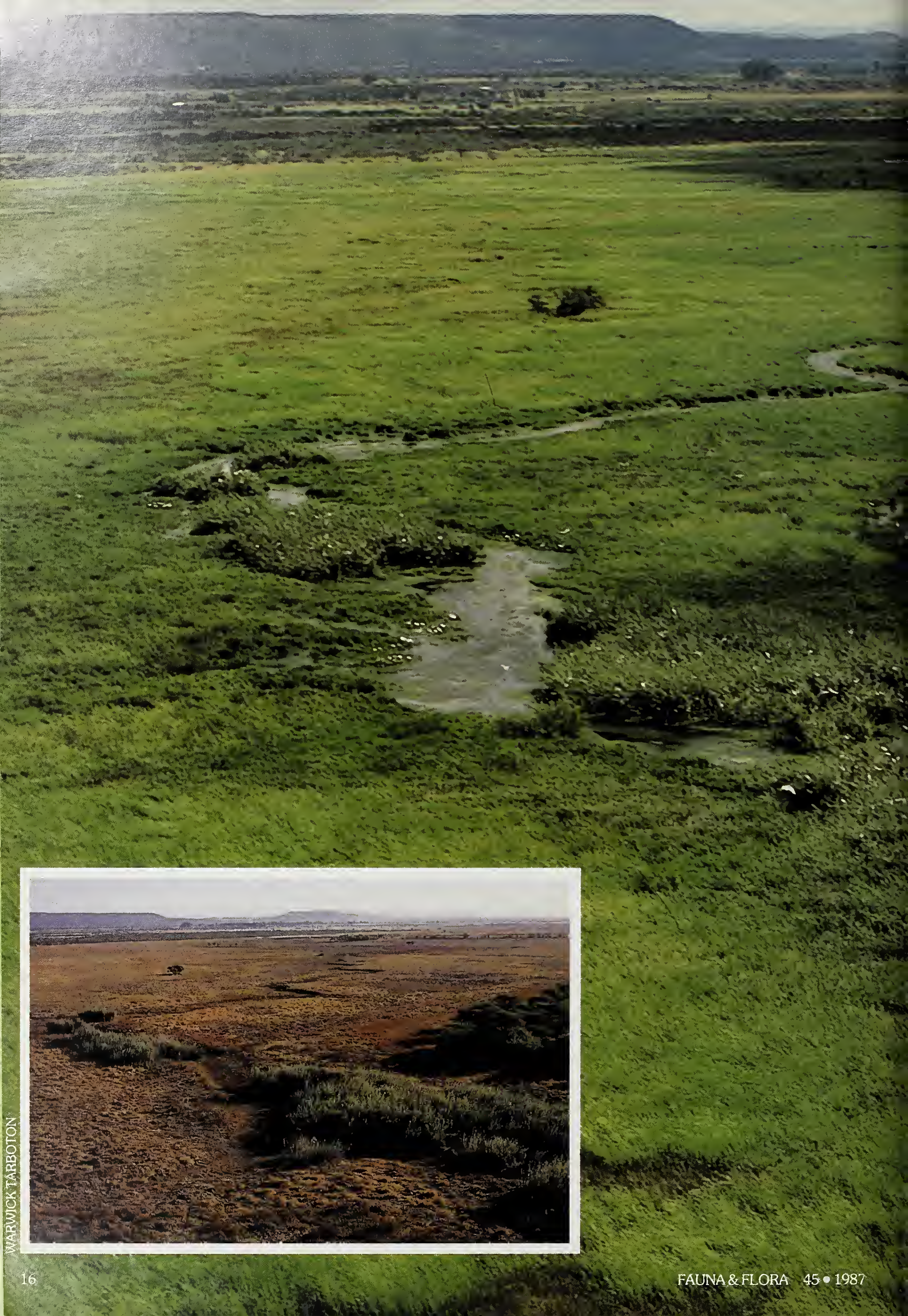


WARWICK TARBOTON

A feast of Frogs, Birds and Fish

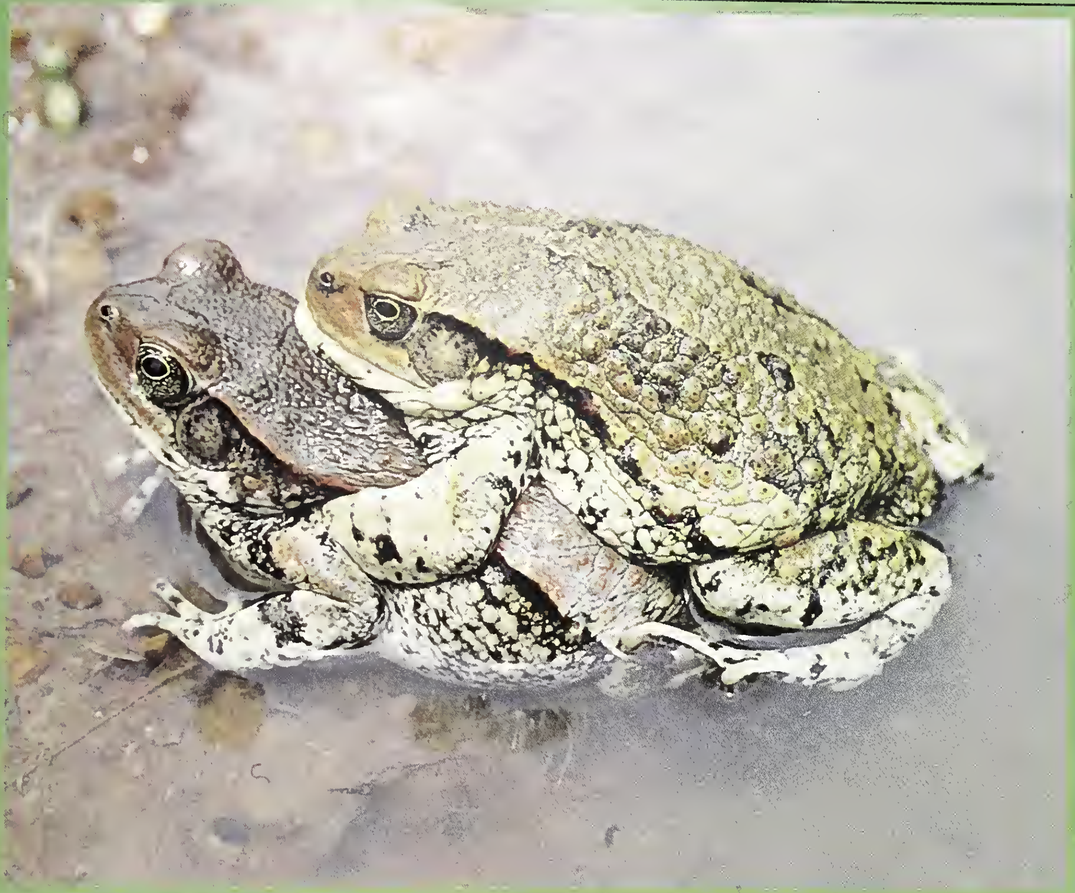
THE flooding of the Nyl is synonymous with the sound of frogs: with strings, wood-winds and brass they produce not a grand symphony of sound, but a cacophony of noise. As students of classical music can pick out the oboe, cello, bass fiddle and viola, so herpetologists can unravel the discordant roar into its individual performers: the 'quoip' of the bubbling kassina, the buzzing of the puddle frogs, the shrill 'pip' of the striped rana, the croak of the common rana and the trilling Indian war-cry of the banded rubber frog. Toads of various species which have been lying buried deep in the ground sometimes hundreds of metres away from the Nyl emerge and scramble down to the newly arrived water to find partners, mate, lay eggs and then disappear again.

But apart from the noise of the frogs, there is a vague disappointment about the flooding; the surge of water that stretches across the floodplain like a lake does not appear to have brought much other life with it. Slowly things get going. The first grasses and sedges appear above the water and then with accelerating speed they transform the open lake into what looks like a waving green grassland — only from the air is the twinkle of water everywhere visible. Countless ribbons of frogs' eggs lie in strands twined among the grass in the shallows. At the road culverts, where the water surges through on its downward course, one can see strings of tiny fish moving in the opposite direction. There is not a great variety of fish to be found in the Nyl system (16 species), but what it lacks in diversity it compensates for in sheer numbers. Most are small species called minnows or 'ghillieminkies' of the genera *Barbus* and *Aplocheilichthys*. Johnston's topminnow, *A. johnstonii,* is the most abundant single species and makes up about 40% of the total fish present. Like other species of minnow, it feeds on mosquitoes, midges, mayfly and their larvae, and shoals often concentrate where water currents suck dead floating insects below the surface — hence the concentrations at the road culverts. A near relative, the striped topminnow, *A. katangae,* is, by contrast, one of the Transvaal's rarest fish species and, apart from occurring in the upper reaches of the Groot Nyl, is known from only two other catchment streams in the province.

There are two *Labeo* species in the Nyl, one of whose type-specimen was first collected in 1963 in the Donkerpoort Dam *(Labeo molybdinus)*, a small cichlid called the southern mouthbrooder, two *Tilapia* species and two species of catfish or barbel. The common barbel *Clarias gariepensis* is the largest fish found in the Nyl, with some individuals growing to a metre in length and having a head as wide as a football. Barbel are great predators of other fish but they are also likely to eat anything they can overpower including frogs, crabs, birds and insects, or they might scavenge from the carcass of a drowned animal or take fallen fruit. During floods they move into shallow flooded grass areas to spawn: females lay as many as 500 000 eggs each and within a day or two these hatch into a myriad of tiny fry. Because the adults are so vulnerable to predators in the shallows, they waste no time getting back into deeper water as soon as egg-laying is over.

WARWICK TARBOTON

Great White Egret



N.H.G. JACOBSEN

Schismaderma carens

With the mushrooming food supply the first waterbirds arrive. Inevitably the first will be ducks — either Whitefaced, Yellowbills, Redbills or Southern Pochard, or all four. The first egrets appear and their flights upstream and downstream soon become a common sight. The Great White, Yellowbilled and Little Egrets are joined by other species of Herons — Grey, Purple and Squacco herons and Black Egrets. They disperse into scattered ones and twos across the floodplain to feed, some species wading and hunting, some still-hunting, standing in shallow water with crooked neck and head poised ready to strike, and one, the Black Egret, fishing by throwing a black umbrella over the water to cut out reflection, then shuffling its yellow feet to stir the ground.

At a few places along the floodplain where there are reedbeds growing over the main channel the egrets and herons congregate to roost at night and to breed. In years when there is a high, sustained flood these breeding colonies are an amazing spectacle with thousands of birds coming and going and nests

WARWICK TARBOTON

Black Egret

WARWICK TARBOTON

Whitefaced Whistling

everywhere at all stages of the breeding cycle. Eleven different species of herons and egrets may be found breeding together in these colonies together with Reed Cormorants and Sacred and Glossy Ibises. In such years the Nyl supports the largest breeding populations of Great White Egret, Black Egret and Squacco Heron known in South Africa.

There are three smaller heron species found on the Nyl which do not join the large mixed heronries in the reedbeds: all of them are rare species in South Africa and listed in the *South African Red Data Book — Birds*. They are the Bittern, the Dwarf Bittern and the Rufousbellied Heron. The first is without question the most secretive bird on the floodplain. Were it not for its call it would go entirely undetected. In the evenings and mornings, and sometimes through the night, it can be heard booming from the extensive areas of flooded rice-grass *Oryza longistaminata*, making a series of 'oomph' sounds reminiscent of the sound of a distant lion: it is a deep, resonant noise which carries for two or three kilometres. The bird is almost impossible to flush and it never seems to leave the depths of the marsh and give views of itself: it is altogether a mystery bird in South Africa, having been recorded from only a handful of localities in the past 30 years, nowhere permanently. During droughts it may go unrecorded for several successive years and then suddenly, when the rains come, it is back again. Somewhere, perhaps in the Central African floodplains, there is a permanent reservoir of habitat which supports the Bitterns that find their way to the Nyl in flood years. The other two species are definitely visitors to the Nyl from the tropics. The Dwarf Bittern occurs regularly in flood years, arriving in December, breeding, and then leaving in April. In 'good' years the Nyl supports a hundred or more pairs of this species which nests solitarily in small, flooded trees and bushes along the fringes of the floodplain. Like the Dwarf Bittern, the Rufousbellied Heron arrives to breed on the floodplain in midsummer but its occurrence here is more erratic and there are some 'good' years which pass without any sign of it. The Nyl, incidentally, is the only locality in South Africa where this species is known to breed.

Another group of birds, known collectively as the *Rallidae* or rails, move on to the floodplain *en masse* when the swath of grass and sedge has reached a level to provide them with suitable habitat. They are a generally secretive and not easily observed family of birds and their presence is usually detected by their sounds rather than by views of them: the rapid clicking notes of the Lesser Gallinule, the 'du du du du' pumplike sound of the Lesser Moorhen, the snoring and wailing of the Purple Gallinule and the sharp 'kriik's of the Common Moorhen — these four species make up most of their numbers. There are almost certainly far more *Rallidae* present on the floodplain in a wet summer than herons but, because they are so much less conspicuous, assessing their actual numbers is guesswork. One attempt to do this involved locating all the active rail and crake nests, first in a one hectare area and then in a 16 ha area, and then extrapolating this density to the whole floodplain: it led to the figure of 43 000 crakes and rails being present in that year. Add to this 12 000 herons (of 17 species) that occur in a 'good' year and a further 19 000 ducks (of 17 species), plus the numbers present of other groups such as cormorants, darters and spoonbills and you will find that in a wet summer the Nyl's waterbird population probably exceeds 80 000 birds.

The Nyl is rich not only in bird numbers, but also in diversity. So far 100 different species of waterbird have been recorded on the floodplain: 85 of the 94 waterbird species known to have bred in Southern Africa have occurred on the Nyl at one time or another. No other South African wetland can claim this. The Nyl also supports a large share of those waterbirds classified as Red Data Species in South Africa: more than three-quarters of the 23 currently listed species occur here. Eight of them breed on the floodplain and a few of these are not known to have bred anywhere else in South Africa. Statistics like these demonstrate the Nyl's uniqueness in this country as a waterbird refuge.

WARWICK TARBOTON

A Bossy female

WARWICK TARBOTON

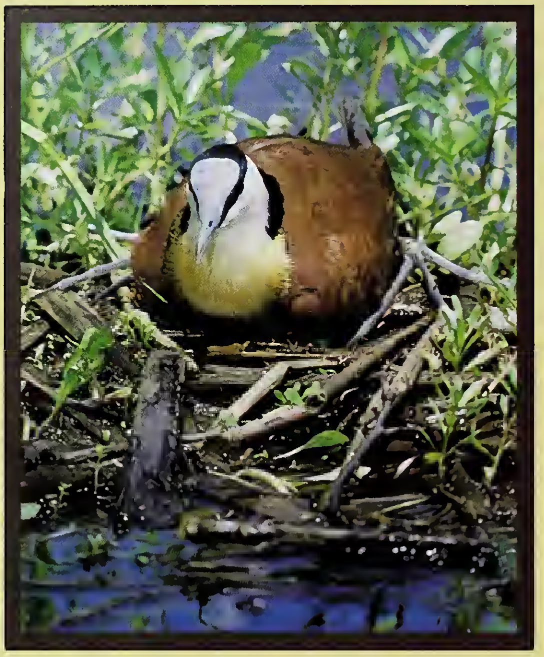
IN years when the Nyl is a 16 000 ha expanse of water, one finds a mosaic of different aquatic vegetation types created by different water depths and their relative permanence. There are expanses of *Oryza* grass, beds of *Typha* bullrush, places where *Acacias* stand in knee-deep water, and places where the water is deepest in which *Nymphaea* lilies form a floating deck of green leaves and pink and white flowers. Here one finds a special little bird of floodplains which is structurally equipped to move about in this picturesque, if unstable, environment. It is pigeon-sized and related to the plovers but has extraordinarily long toes and toe-nails: it is (also) known as the lotusbird or lilytrotter or, more specifically in our case, as the African Jacana.

Many hundreds frequent the Nyl floodplain in the wet years and they are to be found wherever the water is sufficiently deep to permit the growth of *Nymphaea* water-lilies. There is a continual turnover in their numbers, however, and as the floodplain dries out so their numbers dwindle until, when the last lilies become beached, they move away altogether. Jacanas are great nomads, as they need to be as birds exploiting ephemeral wetlands, and one hears of them appearing in the most unlikely places, such as in the Namib and Kalahari deserts.

Apart from their elongated toes they have many adaptations for living like a plover in the habitat of a duck. Their eggs, for example, are water repellent as a result of having an almost unique pore structure, they can swim and dive under water, they have a flightless moult during which time they dive often and long to escape enemies, and they can carry their young about with them under their wings. Their most interesting behaviour though relates to their social system and their breeding behaviour, for they are polyandrous and are one of the best examples of this mating system known in the animal kingdom.

To begin with the sex roles are reversed. The male incubates the eggs and cares for the chicks without help from the female who lays the clutch for him: her share in parental duties does not extend beyond this. Females are larger than males, weighing nearly twice as much, and this, apart from enabling females to dominate males in all interactions, probably also facilitates their being able to lay successive clutches of eggs at short intervals. At any rate prolific females may lay 10 clutches, approaching 40 eggs, in the space of the four-month breeding season. All these clutches are not necessarily laid for the same male: once the first male is tied to incubating his clutch, she turns for attention to other males and is likely to lay subsequent clutches for males B, C or D. She could theoretically lay eggs for, say, ten different males but in practice lays for only two or three, occasionally four, as some of the clutches go to replace earlier eggs that are depredated.

In years when conditions are poor there is a very high egg loss and most of the female's egg-laying is for a single, or perhaps two males, but under more favourable conditions with reduced egg loss, her level of polyandry increases. It seems that egg or more specifically clutch survival, is a crucial factor in the evolution of polyandrous behaviour in jacanas. In the first place it could account for how role reversal came about. In the animal kingdom either female or shared parental care is the norm: male care is rare. What conditions should promote this behaviour in jacanas? Imagine a scenario in which the parental load was light: food was easy to find and the sun helped with the incubation of the eggs, but, for a variety of reasons, egg loss was very high. A nesting pair of jacanas could offset this high loss if the female was capable of relaying as soon as the first clutch disappeared. If the male took on the incubation solo and enabled his mate to feed more and in this way rapidly recoup the nutrients needed for laying the next clutch of eggs, both parents would stand to gain by the arrangement. However, once the male is locked into such a system he has no means of turning back the clock if his mate chooses to lay the next clutch for the neighbour, and the one after that for yet another partner. He either makes do with the situation or he never gets to breed.


WARWICK TARBOTON

In the real world of African Jacanas clutch loss is exceptionally high compared with other species of birds. A sample of 109 jacana clutches was monitored on the Nyl over several years and only 18 of these hatched. The losses are due to a variety of factors. For a start the nests are skimpy or even non-existent and are very vulnerable to the elements: a sudden wind can rock the eggs overboard, sudden rains can raise the water-level and swamp the nest and drying out can beach the nest. Small floating rafts of vegetation on which the jacanas often lay their eggs sometimes sink abruptly and take the eggs with them. On top of this numerous egg-eating birds and animals share the floodplain with the jacanas — Water Monitors, Water Mongooses, otters, Purple Gallinules, herons . . . it is hardly surprising that only 17% get through.

WARWICK TARBOTON

So the males sit grimly on their first, second, third or fourth clutch and now and again one gets through and they are able to raise a brood while the large, heavy-bodied females court a succession of males and churn out eggs like a machine.

Only a small proportion of the females in the population get to breed in any one year; many probably die without ever breeding. All the available breeding habitat is monopolised by a handful of matrons who have won the space to breed by sheer force. Fighting between jacanas, and especially between females, for the opportunity to breed is sometimes a deadly business with the losers standing the chance of being drowned. Breeding females are repeatedly challenged for their space and if they are usurped they join the ranks of the floaters that eke out an existence on the areas of suboptimal habitat and get pushed from pillar to post by the breeders. Feminists living with this sort of stress deserve the rewards of polyandry.

WARWICK TARBOTON

Producers and Consumers

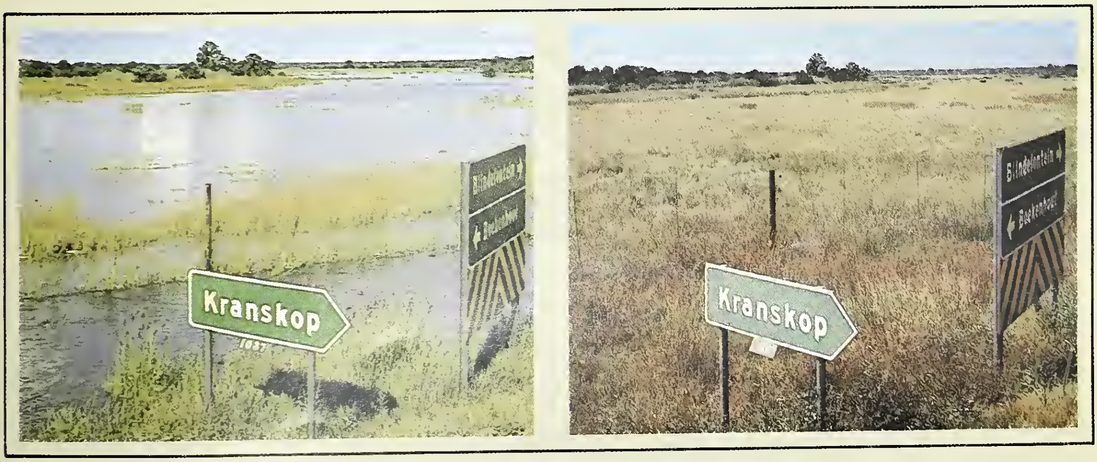
LORNA STANTON

THE 3 120 ha farm Nylsvley 560 KR, lying 10 km south of Naboomspruit, was purchased from the Whitehouse family by the Provincial Administration in 1974 with three purposes in mind: to conserve a portion of the Nyl River floodplain, to establish a breeding station for rare antelope species and to provide a suitable study area for a co-operative research programme that became known as the South African Savanna Ecosystem Project — SASEP.

Both literally and figuratively much water has flowed under Nylsvley's bridges in the twelve years that it has been a provincial nature reserve. The floodplain has experienced both its wettest times, in 1974-1976, when many of the roads were under water for more than a year, and its driest, in the 1980s, when no water came down. The tsessebe and roan antelope breeding programme has been successful and the small nucleus herds that were introduced are now providing stock for relocation elsewhere in the bushveld. A variety of other game species that once occurred in the district has been reintroduced — zebra, wildebeest, giraffe and waterbuck — and are doing well alongside the populations of kudu, impala, reedbuck and others that survived in the area. Over weekends and during holidays Nylsvley is visited by many wildlife enthusiasts who can camp here in unspoilt surroundings and walk about the reserve and enjoy its animals, plants and prolific bird life.

It is, however, the Savanna Ecosystem Project more than anything else that has put Nylsvley on the map. This project was originally conceived under the Council for Industrial and Scientific Research's National Programme for Environmental Sciences to undertake basic research into what makes savannas tick and answer questions like: how does the vast web of interacting organisms hang together? How is the solar energy powering the system dispersed? Where are the bottle-necks in the system? What if these are alleviated? Underlying the motivation for SASEP was the growing realisation that large parts of Southern Africa's savannas are being seriously degraded by mismanagement and that a basic understanding of the system was needed if the situation was to be handled effectively. Scientists from many organisations are participating in the project — from the CSIR itself, from the Department of Agriculture, Transvaal Nature Conservation Division, Transvaal Museum and from seven Universities.

The first phase in SASEP was to provide a detailed description of the physical and natural features of the area. Detailed soil and botanical surveys were undertaken, an elaborate weather-station was commissioned and faunal surveys were made of the



WARWICK TARBOTON

LORNA STANTON

mammals, birds, reptiles, amphibia and invertebrate populations. These inventories highlighted the great diversity of species to be found in savannas as represented at Nylsvley. For example, 325 species of birds were recorded, 62 species of mammals, 57 reptiles, 28 amphibia, and insects and other invertebrate species numbered thousands. Some of the research started in the first phase extended into phase II which involved a closer look at ecosystem processes — soil-water-plant relationships, plant-herbivore relationships, nutrient cycling, production and reduction of leaf litter, and so on.

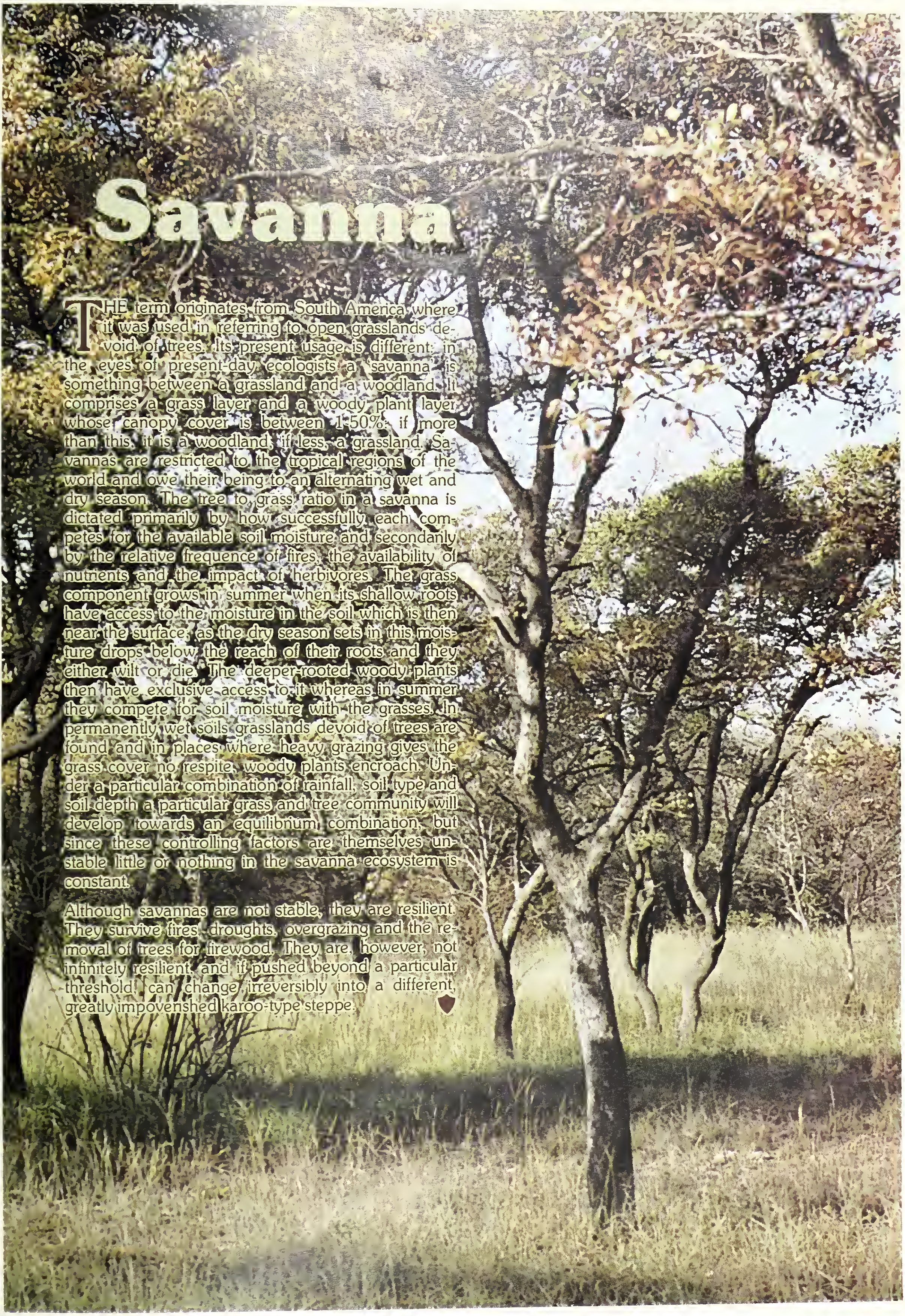
Now, 12 years since its inception, SASEP is entering phase III which is aimed at taking the findings from Nylsvley into the real world of cattle and game-farming, watermelons and mealies, and looking closely at land-use options and the consequences of different land-use practices. This is where the success of the project will finally be judged. Even before that day of reckoning, however, the spin-offs resulting from the savanna programme have more than justified its exsistence: nearly a hundred postgraduate students have received ecological training here as a result of being involved in the project, many prominent scientists from around the world have visited Nylsvley to see the work in progress and to participate in projects (and at least one of them has had to spend an afternoon sitting up a windmill to escape the attentions of an irate ostrich!) and in ecological circles South Africa has become internationally recognised as being up front in savanna studies.

JANET MATTHEWS

Savanna

THE term originates from South America where it was used in referring to open grasslands devoid of trees. Its present usage is different: in the eyes of present-day ecologists a 'savanna' is something between a grassland and a woodland. It comprises a grass layer and a woody plant layer whose canopy cover is between 1-50%: if more than this, it is a woodland, if less, a grassland. Savannas are restricted to the tropical regions of the world and owe their being to an alternating wet and dry season. The tree to grass ratio in a savanna is dictated primarily by how successfully each competes for the available soil moisture and secondarily by the relative frequence of fires, the availability of nutrients and the impact of herbivores. The grass component grows in summer when its shallow roots have access to the moisture in the soil which is then near the surface; as the dry season sets in this moisture drops below the reach of their roots and they either wilt or die. The deeper-rooted woody plants then have exclusive access to it whereas in summer they compete for soil moisture with the grasses. In permanently wet soils grasslands devoid of trees are found and in places where heavy grazing gives the grass cover no respite, woody plants encroach. Under a particular combination of rainfall, soil type and soil depth a particular grass and tree community will develop towards an equilibrium combination, but since these controlling factors are themselves unstable little or nothing in the savanna ecosystem is constant.

Although savannas are not stable, they are resilient. They survive fires, droughts, overgrazing and the removal of trees for firewood. They are, however, not infinitely resilient, and if pushed beyond a particular threshold, can change irreversibly into a different, greatly impoverished karoo-type steppe.



WARWICK TARBOTON

DIVISION OF NATURE CONSERVATION

Forbidden fruit

DESPITE what kudus probably think, the foilage growing on trees and shrubs is not there simply to feed passing animals: it serves as the lungs of the plant and some plants go to much trouble to protect themselves against hungry herbivores, be they ungulates, caterpillars, beetles or invisible pathogens. At Nylsvley a number of research projects have focused on this plant-animal interface and come up with interesting findings.

The kudu is one such herbivore whose feeding habits have been researched here. It obtains about two thirds of its food from trees and bushes and the rest from forbs, and it eats virtually no grass. When feeding it keeps on the move, seldom stopping for more than a minute or two at a bush before moving on to the next. It feeds selectively and doesn't simply eat the next plant that crosses its path. A researcher, Dr Sue Cooper, attempted to find out what factors dictated the kudus' selectivity: was it nutrients in the leaves, or secondary chemicals, or was it the presence of thorns or spikes? Using five tame, hand-reared kudus she followed individuals about as they fed, keeping a detailed record of what they did at each food stop — the plant species, how long they ate it, how large each bite was, and so on. At the same time she laid a trail of string to mark the kudu's route and later returned to analyse the options open to the animal all along this path.

Dichapetalum cymosum

N.H.G. JACOBSEN

There was a seasonal variation in their eating habits brought on by the deciduous nature of the plants of the habitat. For as long as the trees were in leaf their preferred food plants were the climbing raisin brandybush *Grewia flavescens* and the sickle bush *Dichrostachys cinerea*; when these dropped their leaves in winter their first choice became the monkey orange *Strychnos pungens*, a spiky-leafed tree which they hardly touched in summer but, being evergreen, was one of the few plants in the study area offering them green leaves in winter. When fruit was available, for example marulas during January-March and *Grewia* berries in May-June, the kudu were greatly attracted to these. The kudu's preference was not dictated by the nutrient status of the available plants so much as by the levels of secondary chemicals in the plants. They totally avoided plants with high toxin levels: the deadly gifblaar, *Dichapetalum cymosum*, for example, was totally avoided by the kudu, and by other indigenous game species, whereas domestic stock are often attracted to its green leaves in spring and die from eating it. The particular chemical affecting the kudus' choice was tannin — any tree or shrub with levels of tannin-C above 5% was not eaten. This meant that the commonest trees in the area, *Burkea africana, Terminalia sericea* and *Ochna pulchra*, were not touched by kudu except during a short period early in the growing season when the young leaves were unprotected. Some plants, particularly *Acacia* species, were nutritious and did not have particularly high tannin levels but were eaten less than expected. In these cases it was their thorns that made them unattractive to hungry kudu; the nasty spike-and-hook combination of *Acacia tortilis* in particular made it very time-consuming for a decent meal to be had. (Research elsewhere has shown that the development of this weaponry is carried further in *Acacia tortilis*: young trees and the lower branches of older trees that are within the browsing range of herbivores have far more thorns than higher branches that are out of range). Anyway, because so much of the vegetation in broad-leaved savanna is useless to kudus, this species tends to occur at low densities and to range widely.

JANET MATTHEWS

Grewia flavescens

Ochna pulchra seed

N.H.G. JACOBSEN

Kudu have an exceptionally high mortality during droughts when they are confined to small game-fenced areas from which they cannot escape. The problem is obviously related to food, or the lack of it, and Professor Wouter van Hoven's research, done partly at Nylsvley, has given an interesting twist to the tannin saga. The presence of tannins in plants, and their role in keeping leaf-eaters at bay is well known. One of their uses is in curing ('tanning') animal hides in which the tannin reacts with protein molecules in the hide to form an insoluble tannin-protein compound which is not attacked by micro-organisms. The tannins are a complex of chemicals and one member, a condensed tannin or leucoanthocyanodin (called tannin-C here) does approximately the same thing inside the kudu's rumen: it reacts with the protein-based enzymes which are responsible for digesting the leaves eaten to form an inert tannin-protein complex. So kudu eating tannin-loaded leaves may have full bellies but derive no nutrients from the meal.

His research showed that some of the plant species being eaten by kudu initially had low tannin levels in their leaves but within minutes of their being browsed these levels rose: in *Acacia caffra*, for example, the tannin level in the leaves doubled within 15 minutes; if left undisturbed, it took two or three days before reverting back to its normal level. This reaction may explain why kudu do not stay browsing for long at the same bush, even though there are still lots of uneaten leaves available; the plant

WARWICK TARBOTON

Burkea africana

mobilises its chemical defences and the kudu responds to the increasingly bitter taste in the leaves by moving on. When kudu are trapped in a restricted area and plant growth drops (in winter, or during droughts) the browsing pressure on favoured plants will increase to the extent that each individual plant is frequently revisited, and its tannin-C response is repeatedly triggered so that levels in the leaves remain high. These leaves simply go through the kudu undigested and the animals eventually starve to death despite their full bellies. An even more interesting phenomenon which warrants further investigation is the apparent ability of plants to 'warn' their neighbours of the presence of a browser so that they can muster their defences in advance. The mechanism for this is probably the plant releasing aromatic or volatile compounds into the air when it is browsed which are picked up by neighbours of the same species.

While the finding that tannin can be mobilised in plants and aromatic compounds can be released under browsing pressure are not new discoveries, their relevance to the kudu die-off syndrome is intriguing.

Euphorbia Ingens

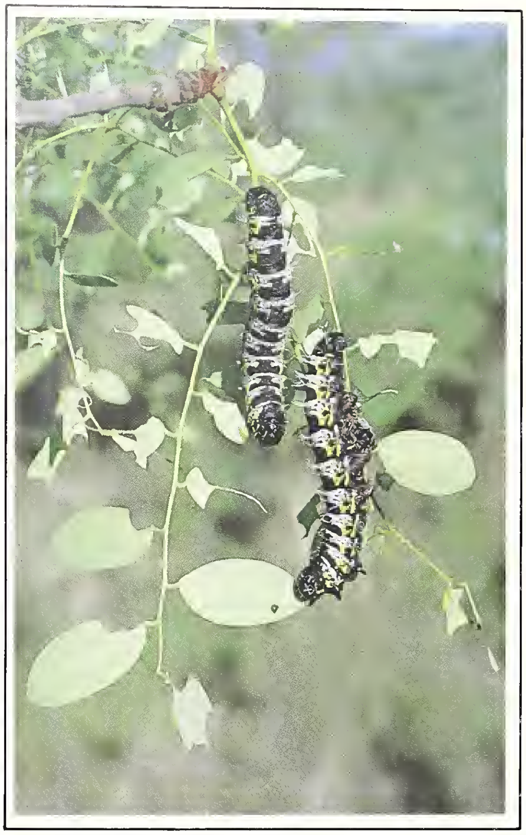
STEVE FOURIE

Xerophyta retinervis

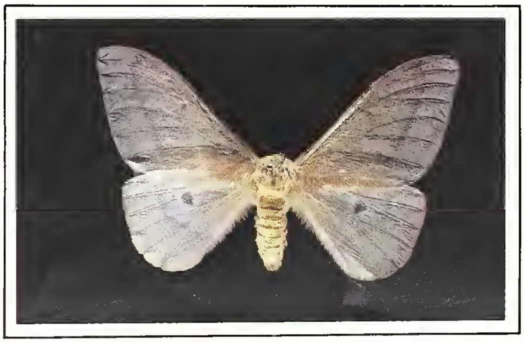
WARWICK TARBOTON

Cirina fordi

IN September when the broad-leaved savanna starts responding to the quickening pace of spring and dons its green mantle of leaves, a sombre-coloured insect emerges and seeks out the wild syringa *Burkea africana* on which to lay its eggs. This is *Cirina fordi*, a nondescript brown moth about 25 mm long, which in some years has a spectacular impact on the woodland. The female lays its innocuous-looking batch of eggs — 500 or more, each about 2 mm long and all clustered together — on an outer twig of the host tree, close to the emerging leaves on which the hatchling caterpillars will feed.


WARWICK TARBOTON

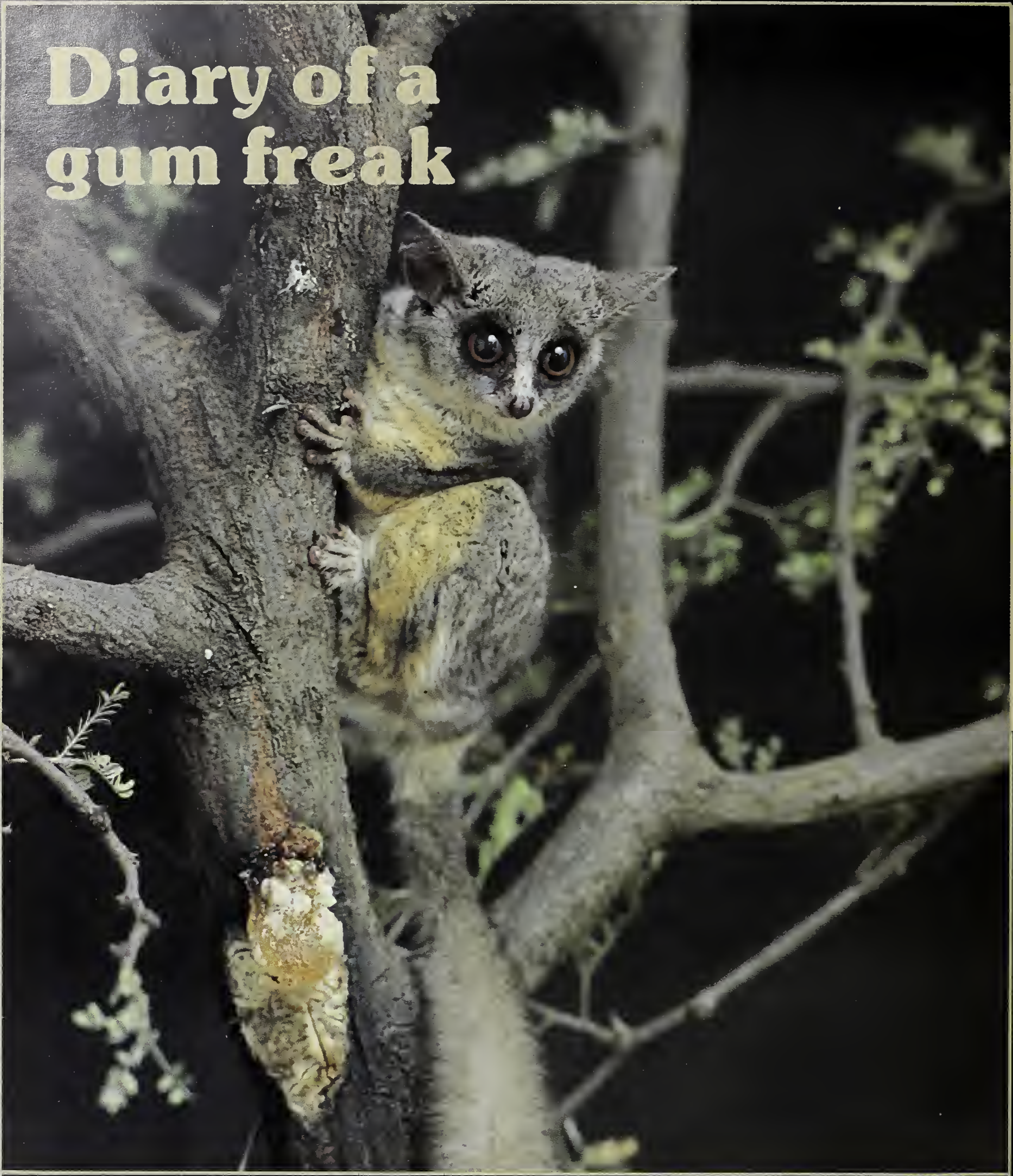
The eggs take nearly a month to hatch, a month in which a variety of predators from tiny *Crematogaster* ants to birds take their toll and reduce the number of eggs present by perhaps three-quarters. Still, one quarter of 500 eggs multiplied by countless thousands of moths is a lot of baby caterpillars to be unleashed on the *Burkea africana* population in the flush of spring before their vulnerable leaves have mustered their defences. The little brown caterpillars get to work on the foliage and grow and grow, progressing through six moults (each stage called an 'instar') to emerge finally as large, conspicuous caterpillars 50-60 mm long. The early instars are cryptically coloured but from the fourth instar onwards they assume a striking black and yellow colour. This change is probably related to a change in anti-predator strategy, from being cryptic (hiding from would-be predators) to aposematic (frightening would-be predators). Neither strategy is entirely successful: the survival of a batch of 1 000 free-living larvae was monitored at Nylsvley by a researcher, Stephanie Nunn, during the 38 days that it took from their hatching to reaching the final instar. Thirty nine survived. (The larvae have one particularly unpleasant predator, a pentatomid bug, which pokes its beak into them and sucks them dry). At the end of November the survivors pupate and thus close the annual cycle. In some years a few may emerge in February, but most remain underground as pupae through to the next spring.


JANET MATTHEWS

T V L MUSEUM

There are some *Cirina fordi* about every year and their presence is readily detected by seeing patches of defoliated *Burkeas*. Usually such defoliation is confined to scattered patches, but in some years every single *Burkea*, large and small, is stripped bare of its leaves over areas extending many kilometres. These outbreaks do not kill the trees but they do set back its growth for that year. There is no satisfactory explanation for the occurrence of these *'Cirina'* years. It has been suggested that in times of stress, such as during a drought, the chemical defences of the trees are affected and their increased vulnerability leads to massive defoliation by such larvae. However the outbreaks are not related to particularly dry or wet years, not to hot or mild summers, nor do they follow a regular periodicity. Perhaps like many other episodes in nature they are simply haphazard events and the consequence of a 'lucky' year (for the moth) in which there was a particularly good emergence, their timing with respect to foliage emergence was right on target, and the pentatomid bugs and other 'nasties' were at a low ebb.

Diary of a gum freak



JANET MATTHEWS

IF you happened to drive along one of the less busy farm roads fringing the floodplain at night you could well pick up in the car lights in the bush beside the road a pair of glowing red dots which bob and dance before you, disappear and reappear. You are looking at one of the most endearing little denizens of the savanna — the lesser galago, more familiarly known as the 'nagapie'. It is a primate, as is man, but of miniscule proportions, weighing only 150-200 g and measuring about 350 mm in length, more than half of which is tail. With its big ears, pinched up little face and enormous eyes the nagapie was clearly the inspiration for the fictitious character 'ET'.

It is common here, especially in the acacia areas, and the intricacies of its social behaviour were unravelled in a study done on one of the floodplain farms, Mosdene. During his two-year study, the researcher, Dr Simon Bearder, lived a nocturnal life to match that of his subjects, following and observing various individuals, each fitted with a radio transmitter, through the night. His and their day began at sunset. During daytime nagapies sleep either solitarily or in small groups in holes in trees or in small leafy nests which they make themselves; at dusk they emerge and, much like their hominid counterparts, after a period of leisurely stretching, yawning and general grooming, they get to the business of finding a meal. Here the likeness with man stops. One of their habits is that of urine-washing and of keeping the soles of their hands and feet moistened with urine. The purpose of this latter habit is probably to enhance their grip on branches. This is necessary because nagapies don't walk about, they leap about, creating the dancing lights — their highly reflective eyes — which one sees in the carlights at night. Unless they are engaged in the business of courtship their nocturnal wanderings are generally solitary affairs and each individual moves about through its home range which, in the course of time, it must come to know intimately.

In summer nagapies eat a variety of things, including insects such as moths, grasshoppers and beetles, spiders and exuded gum. In winter as the availability of invertebrate prey diminishes they become increasingly dependent on gum. Each individual quickly learns the places within its beat where gum is to be found. On cold winter nights they are likely to go from one gum site to another as quickly as possible and when satiated to go straight back to bed, even if the night is still, so to speak, young. The gum eaten by nagapies oozes from various species of *Acacia*, especially *A. karroo* which is a common tree on the floodplain. The gum is produced by the trees in response to attacks made on it by wood-boring beetles and their larvae — this is apparently a defence mechanism by the trees against these insects. A single ooze can produce half a litre of gum a month for several successive months. The gum consists of carbohydrate and water with small amounts of fibre, protein and minerals present and is sufficiently nutritious to keep nagapies going during the lean months.

Nagapies have a complicated social system. Females rear the young without help from males; they have two litters a year, one in January-February and a second in September-October and raise one or two young each time. Adult females occupy territories 10-15 hectares in size and exclude all other females from these except, sometimes, their daughters whose presence may be tolerated for a time. Normally the young, irrespective of their sex, are pushed out when three to four months old, or about when the next brood is due. These weaned youngsters range a few kilometres from their birthplace before settling into territories of their own.

Males are more sociable than females and several may share a common range which often overlaps with the territory of one or more females. The territorial females do not attempt to exclude these males, perhaps because they can't as the males are larger. When the territorial females come on heat, which happens for ten days twice a year, the strong hierarchy that exists in the male groups becomes apparent. The male in the alpha position courts the female, constantly escorts her and frequently mates with her. He is then particularly aggressive towards other males sharing his range and tries to prevent them from coming close to, or mating with the receptive female. He is not always successful, but on balance he has the most copulations and thus has the greatest chance of being father of the next litter which is born 3½ months later.

WARWICK TARBOTON

Although nagapies can live for 15 years in captivity they are very unlikely to do so in the wild where the wear and tear of living is so much more severe. Apart from the problems of survival in the winter months, when both food levels and night temperatures are often low, they face several predators. They are particularly vulnerable to the small spotted genet which, like them, is nocturnal and a very agile tree-climber. Nagapies are most vulnerable when on the ground, not only to genets, but probably also to owls. For this reason they keep to trees wherever possible and are cautious about crossing open areas. They have also been preyed on by African Hawk Eagles in the vicinity of Nylsvley and one can only surmise that this must happen in the early morning when they are tempted to sit on an exposed branch to warm up in the early morning sun. Were it not for such vicissitudes in their lives the savanna around the Nyl would be teeming with nagapies; as it is they are common enough and their presence adds one more element to the intricate web of life that is woven into the savanna.

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DIVISION OF NATURE CONSERVATION

NOW, in 1987, this unique food-chain which is so rich in its diversity of fauna and flora is being threatened.

At present the City Fathers of Nylstroom are planning a second dam in the Olifantspruit. On the one hand this dam will offer the residents of Nylstroom security in times of drought, but on the other the Olifantspruit is the main source of water for the floodplain of the Nyl, and supports the breeding populations of all the waterbirds talked about.

Were the dam in fact to be built, the floodplain and everything associated with it may be lost. Furthermore there is no guarantee that the dam will solve Nylstroom's problems during droughts. Is it possible to find a compromise between the interests of man and nature — one which could ensure the survival of both?

◆

Kassina senegalensis

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Transvaal Directorate Nature Conservation

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Front Cover:

The buffalo, *Syncerus caffer*, one of Africa's largest ruminant with a mass of up to 800 kg, looks like a stout bovine. It is reddish brown to black in colour. Full-grown animals have a very sparse hair-cover, and both sexes boast curved horns, the massive bases of which form a heavy, protecting shield over the forehead.

Important habitat requirements for buffalo are a sufficient quantity of grass, shadow and water. Buffalo drink water regularly, usually twice a day, and are inclined to graze near water.

Buffalo are mainly grazers but a small percentage of their forage consists of browse. They forage mostly during the night, probably because it is cooler then. Buffalo have a limited ability to regulate their body temperatures and if they are exposed for too long periods to the midday sun they become overheated.

In general, buffalo are placid animals, although they have a reputation of being the most dangerous animal species that can be hunted in Africa.

The buffalo is one of the few herbivores that can defend itself with a large measure of success against predators.

Having been hunted excessively, and on account of the rinderpest, the buffalo has become extinct in most parts of South Africa. Today, it is to be found only in a few national parks and other reserves such as the Kruger National Park, the Addo Elephant National Park, the Loskop Dam and Percy Fyfe Nature Reserves.

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According to historical documents large and widely distributed game populations roamed South Africa in former times. As early as 1669 the authorities realised that big game had to be conserved, and the first hunting licences were issued during that year. But despite that, hunters culled game populations to such an extent during the years that followed that some game species were forced to move to areas that were only marginal habitats for them or were completely unsuitable for their survival. This lead to the extinction of the blue antelope (*Hippotragus leucophaeus*), quagga (*Equus quagga*) — there is a growing opinion that prefers to consider the quagga as the southernmost subspecie of the Burchell's zebra (*Equus burchelli*)-, a subspecies of the Burchell's zebra (*Equus burchelli burchelli*) and the Cape lion (*Panthera leo melanochaitus*). The bontebok (*Damaliscus dorcas dorcas*), black wildebeest (*Connochaetes gnou*), oribi (*Ourebia ourebi*), mountain zebra (*Equus zebra*), Addo-elephant (*Loxodonta africana*) and square-lipped rhinoceros (*Ceratotherium simum*) nearly also reached extinction.

Mammals are dependent on a wide range of components in nature; therefore, the conservation of this animal group consists not only of the conservation of the animals themselves, but also of the conservation of other organisms and the environment with which they interact.

Nature conservation is a dynamic process, however, because natural ecosystems change continually. Nature conservation is not an attempt to prevent natural changes from taking place, since ecosystems will change in time even without the interference of man, but with conservation the aim is to prevent the extinction of species because of the influence of man. A thorough knowledge of the principles of ecology is a prerequisite for the successful conservation and management of mammal populations.

Nature conservation research on mammals commenced in the Transvaal during the 1950s with a professional officer's post created for research into the question of problem animals in the SA Lombard Nature Reserve. Today, there are many different posts dealing with numerous facets of mammal research.

Since the functioning of natural ecosystems are very complex and continually changing, the small team of scientists of the Directorate cannot work on research projects over prolonged periods of time on their own.

It is the overall objective of the research programme of the Directorate to provide information to the Director, thus facilitating sound decision making *apropos* conservation problems. Emphasis is laid upon the determination of the conservation status, of tendencies of game populations or their environment, and of the endangering of species or ecosystems. Research solely aimed at extending scientific knowledge is in other words avoided.

Research and other conservation actions receiving attention in the Transvaal deal with various subjects such as rare and endangered mammals, the status of exploitable game, ungulate censusing, problem animal control, the Lowveld ecosystem, mammal exploitation (game farming), the monitoring of small mammals, and the capture and relocation of game.

The conservation goals of the Directorate in respect of mammals are, firstly: "To make certain that no mammal species of the Transvaal will become extinct" and, secondly: "To control the orderly utilisation of game species by means of legislation".

The Directorate is actively involved in certain long-term research projects of, for example, the CSIR and the universities. Under certain circumstances the Directorate's facilities are available to researchers of outside organisations.

It is the objective of the International Union for the Conservation of Nature and Natural Resources (IUCN) that each country should try to reserve at least ten percent of its surface area for nature conservation. This is an impossible target to reach in South Africa if we take only our national parks and provincial nature reserves into consideration. There is not enough land for representative samples of each plant and animal community in South Africa to be proclaimed as a conservation area, however, with the efforts of the private landowners the objective of the IUCN can be reached. The contribution of private landowners to nature conservation is supported by the Directorate of Nature Conservation. Game farmers have already made important contributions to nature conservation, *inter alia*, the preservation of the sable antelope and black wildebeest.

South Africa's natural resources are subjected to more and more pressure because of the unavoidable exploitation of such resources and the increasing demand for living space. The owners of private game farms and other private land consequently play a very important role in the conservation of our mammals.

The activities of the Mammal Section of the Transvaal Directorate of Nature Conservation expanded from research into the question of problem mammals during the 1950s to a wide field of research and conservation activities that include the protection, utilisation and monitoring of mammals. In this issue of *Fauna & Flora* we take a closer look at some of the facets of the activities of the Mammal Research Team.

MR G.P. VISAGIE
Assistant Director: Mammals,
Birds, Reptiles and Amphibians

JANET MATTHEWS

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JANET MATTHEWS

Vermin Problem Animal Damage Control

PETRUS VAN RENSBURG / THYS DE WET

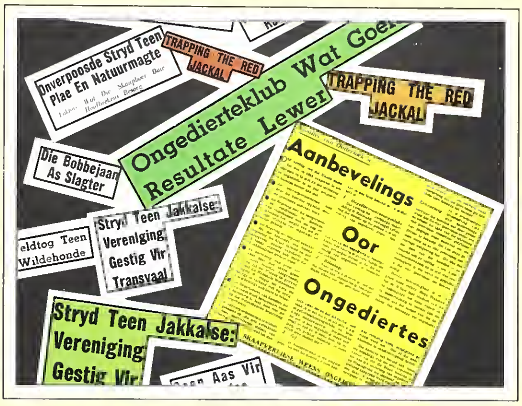
From time immemorial the feeding habits of wildlife clashed with the activities of man. The earliest animal control record is in the Bible, i.e. when David protected his father's sheep against wild beasts. As early as 1656, in South Africa, Jan van Riebeeck reputedly offered bounties for the extermination of predators. Today, in spite of the Government's involvement and efforts of organised agriculture, wildlife still cause economic losses. Those losses are a reality and often require drastic control measures. However, whenever he takes drastic action, the nature conservationist must also take Nature herself into consideration.

The phenomenal increase of the human population after the Second World War put the natural environment under increased pressure and resulted in a greater awareness of nature conservation. Attitudes with regard to vermin also changed and *problem animals* became the accepted term, since such animals are regarded as a necessary part of nature too. It became evident that efforts to exterminate problem species were an exercise in futility, and the emphasis shifted to *control*. It was found that only a certain percentage of the problem animal population was responsible for losses, while the animals themselves were no longer regarded as problems as such, only the losses they caused. Such losses are like droughts, they are agricultural risks. The current approach therefore emphasises loss and damage control, and the success of a control measure is seen in terms of reduced losses and damage not the number of animals killed. Furthermore, if a predator catches its natural prey that cannot be regarded as a loss.

Since its inception in 1947 the Transvaal Directorate of Nature Conservation has been involved in problem animal control. Then, for the first time, problem animals were defined by law and were not just, as a matter of course, all animals causing problems, but a species had to be declared as such by the Administrator. According to the Transvaal Nature Conservation Ordinance, (Ordinance 12 of 1983), problem animals are black-backed jackal (*Canis mesomelas*), caracal (*Felis caracal*), baboon (*Papio ursinus*), vervet monkey (*Cercopithecus aethiops*) and bush pig (*Potamochoerus porcus*). These animals have been declared problem animals, since the losses and damage they cause are wide-spread and, on account of their habits, organised efforts are often required to control them. Legislation allows landowners certain exemptions from restrictions so that they may protect their property against problem animals. Legislation also makes provision for the establishment of hunting clubs so that organised control can take place.

THYS DE WET

Such clubs may be affiliated to the Federal Problem Animal Control Association. The Association is subsidised by the Directorate of Nature Conservation and renders professional service to the farmer. By law, clubs are subjected to inspection, while non-selective methods are restricted or controlled.


Onverpoosde Stryd Teen Plae En Natuurmagte

TRAPPING THE RED JACKAL

Ongedierteklub Wat Goe
Resultate Lewer

TRAPPING THE RED JACKAL

Die Bobbejaan As Slagter

Stryd Teen Jakkalse:
Vereniging Gestig Vir Transvaal

eldtog Teen Wildehonde

Aanbevelings Oor Ongediertes

Stryd Teen Jakkalse:
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Gestig Vir

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The Problem Animal Control Unit of the Directorate of Nature Conservation at Dewagensdrift, Groblersdal, gives advice and limited assistance to the public, not only with regard to problem animals, but also in cases of loss or damage on account of any animal. Special attention is given as far as protected animals such as leopard (*Panthera pardus*), cheetah (*Acinonyx jubatus*) and brown hyaena (*Hyaena brunnea*) are concerned. The unit consists of trained staff involved in several aspects of problem animal control. Their duties are, *inter alia*, the inspection of hunting clubs and the monitoring of problem animal populations, losses, damage and control measures. Technical assistance with research projects is also rendered.

During the 1940's sheep farmers blamed problem animals for astronomical stock losses. Allegations were made that "vermin" annually killed 180 000 sheep. According to *The Wool Grower* this figure rose with 60% in the two years preceding 1949. In a certain area leopards allegedly killed 1 000 sheep in two years' time. In another area leopards were also blamed for killing 111 sheep in one week. In 1945, in spite of varying opinions with regard to the existing bounty system, the Transvaal took the lead by instituting a Commission of Enquiry into Game Protection, and recommended that the bounty system be abolished. According to different reports, the bounty system did not fulfil its function but lent itself to political exploitation. All those reports recommended intensive scientific studies regarding the animals concerned, in order to formulate effective control measures. Consequently, the National Wool

Growers Association in 1948 requested that the Provincial Administration establish a locality where specific research on "vermin" could be done. The Executive Committee resolved to establish a research station at Panfontein, at present the SA Lombard Nature Reserve, near Bloemhof. From the beginning the research was aimed at developing effective and selective control measures that would create the least disruption of the environment.

DIRECTORATE OF NATURE CONSERVATION

At that time the employment of hunting was regarded as the most effective way of controlling black-backed jackal, and this led to the development of a breeding and training station for dogs at Panfontein. In 1950 the first dog handler, and in 1951 the first professional officer were appointed. Six dogs were imported from Britain and an attempt was made to breed a foxhound suitable for South African conditions. The new breed eventually had one-eighth English, a quarter Welsh and five-eighths Fell Foxhound blood. Three years after the breeding programme was initiated, the first team of trained hunting dogs were sold.

Trained dogs were essential for jackal hunts, since untrained dogs also killed non-target animals. Cases were documented where a single untrained dog killed 4000 springhare, 160 steenbuck and several other harmless species like Cape hare and aardwolf.

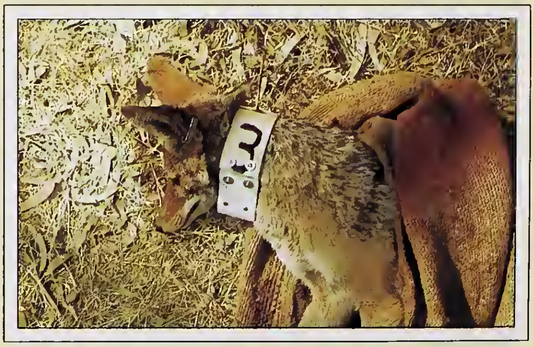
During 1961 and 1962 experiments undertaken in the Transvaal tested the effectiveness of the *humane coyote getter*. This devise is buried under the ground so that only the head, covered with ripened bait, protrudes above the ground. When a jackal attempts to pick up the bait, cyanide is injected into its mouth. The smelly bait plays a key role in the effectiveness of the getter, and has proved to be an additional measure for problem animal control. Since the getter is a dangerous tool and its incorrect use can result in the target animal developing an avoidance reaction, well-trained persons are needed for its effective use. An in-depth study has subsequently been made on the different bait types and the effective use of the getter. Trained dogs are still, however, more effective than this device, although it is more economical to use the getter. Today, the getter has almost replaced the hunting dog in jackal control.

Research into diet of the black-backed jackal and other related carnivores was initiated during the sixties. The results dispelled many myths. For example, the popular belief that aardwolves and bat-eared foxes were responsible for killing sheep was disproved. It was also found that only 24% of the black-backed jackal killed during control operations had actually fed on sheep. Should the whole jackal population be taken into account this figure may be lower. According to the Department of Statistics only 10% of all sheep losses during 1960 could be attributed to predation. Investigations in Natal also revealed that domestic dogs were responsible for 80% of the sheep losses. Such research shows that it is imperative that the culprit animal be identified, and that it is more cost-effective to concentrate on individual culprits in a control action.

During the same period, also, initial studies were made of the movements of black-backed jackals. This was followed by pioneer work on radio-telemetry studies on animals in South Africa. It was found that the black-backed jackal is a territorial animal. A male and a female occupy the same territory. In the Transvaal, territory sizes range between 10 km^2 and 90 km^2, depending on the availability of food. Other full-grown jackals are actively chased out of such a territory. Consequently, subadults (full-grown but unproductive) are nomadic, looking for their own territory. It was also found that the mortality figure for young jackal was 60%. This phenomenon has serious consequences regarding rabies control. Attempts to suppress a jackal population will lead to territorial disputes, which may accelerate the spreading of the disease.

Also, during the 1960's, similar studies were undertaken regarding baboons. The effects of the elimination of specific individuals and specific numbers of individuals of a troop in the troop itself and on neighbouring troops were investigated in order to determine effective control measures. An extremely successful capture method was developed as a result of the knowledge gained of baboons' behaviour, social

JANET MATTHEWS


THYS DE WET

system and space utilisation. This was also applied to vervet monkeys and, accordingly, this capture method is effectively used for monkeys today.

The Directorate of Nature Conservation is at present busy with a full-scale research project on the bush pig. Since little is known about this animal, ordinary control measures are ineffective. This study is aimed at identifying the factors controlling the extent of bush pig damage, and developing new control measures and/or applying effectively those control measures already developed. The selective and effective application of poison in problem animal control are investigated so that constructive recommendations may be submitted. The damage caused by and the control of problem animals, and other animals as well, are being scientifically monitored, as far as practicable, in order to determine tendencies and formulate predictions or explanations.

One should realise that human activities are to blame for the creation of suitable environments for problem animals. Incorrect approaches in the past have not only left unsolved problems, but often also a deterioration of the situation. The continual use of poison in the Northern Transvaal, where black-backed jackal have become suspicious of any bait, serves as an example. Problem animals are highly adaptable animals that with time learn to avoid any control measure. Long-term continuous studies are therefore necessary to enable us to keep one step ahead of the problem. Even today there are no easy, cheap or instant solutions.

On this point an American biologist expatiated as follows: "The American people are strong and powerful, the foremost in the field of research and technology. They have already put a man on the moon and their spaceships have travelled past the furthest planet in our solar system. With all this technological progress and know-how they have not yet succeeded in effectively controlling that flea-bitten, howling, ugly dog." He was referring to the American coyote which is the equivalent of our black-backed jackal. The coyote has, in spite of extensive control measures taken over the past century, managed to multiply and extend its range.

To anyone who does not see problem animal control as one of the principles of nature conservation, but as a conflicting activity, Prof. W.E. Howard of the University of California has the following to say: "In conclusion, those of you who are experienced in wildlife damage control can take great pride and honestly claim that you have preserved more non-target species, done more toward restoring a healthier ecosystem, and practised better wildlife husbandry in disturbed environments than has been accomplished by many conservation-environmental organisations with millions of dollars. They waste their energy and money by playing an advocacy role and promoting anti-control propaganda to raise more money for advocacy, instead of working toward alternative solutions to wildlife damage problems, whereas you demonstrate genuine compassion for all living organisms by your research for better solutions. Wildlife damage control is an integral part of life, and it helps establish true harmony between man and nature. The role of a predator, including man, is vital in the harmonious functioning of animal communities. Actually, those of you in wildlife damage control probably understand the ecology of vertebrate control, the brutality and cruelty of nature, better than most ecologists, wildlifers, or zoologists; thus, you are more of a patron saint of wildlife conservation than the idealistic environmentalists. Since nature's way in environments modified by man is neither rational nor ethical, I find that it is actually those involved in animal damage control who are working the hardest to establish morality in the role of man in nature. Don't you agree?"

LORNA STANTON

Hans Hoheisen

Wildlife Research Station

P.A. DE VILLIERS
E. PIETERSEN

The history of nature conservation in the Lowveld dates back to 1904 when the area between the western boundary of the Kruger National Park and the escarpment, together with some of the southern portions of the Kruger National Park, was known as the Sabie Game Reserve. During 1922 the area outside of the present western Kruger Park boundary and the escarpment was deproclaimed and made available to cattle farmers. Although the Klaserie Private Nature Reserve was only proclaimed in 1970 the landowners of the farms in the Sabie Sand, Timbavati and Klaserie Private Reserves had established game protection associations as early as the 1950's.

These landowners have now proposed that the existing fences between themselves be removed. Negotiations are presently under way to achieve this goal and the possibility exists that this considerable area will be managed as a single entity in the future.

Besides the large private nature reserves mentioned above a number of small private nature reserves and game farms have been established in the Lowveld.

During 1951 Mr Theuns Steyn, the then Director of Nature Conservation, emphasised the necessity of research in the Transvaal. Although the conservation effort in the Lowveld in the 1950's was not as developed as it is today, it still prompted Mr Theuns Steyn to emphasise the necessity of research in the Transvaal as early as 1951. Consequently research needs for the Lowveld were determined and various projects initiated. The first nature conservation orientated research project undertaken by the Transvaal Nature Conservation Division was that of Dr Stan Hirst and Mr Matt Gilliland in 1962. This project was an ecological survey of the Sabie Sand Game Reserve. A similar project was later repeated in the Timbavati Private Nature Reserve. During these studies attention was given to habitat preferences of game, energy flow, carrying capacity of the veld, movements of game and their distribution as well as game management. Trials were also carried out with respect to bush clearing and controlled burning.

A further project entitled "The opinions of Game Reserve Owners in the Eastern Transvaal Lowveld with regard to Nature Conservation" was undertaken by Mr A von W Lambrechts with the view that the future of nature conservation in the Lowveld is going to depend on the attitude of the landowners.

Research personnel were dependent on the hospitality of landowners for accommodation and this lead to the concept of the establishment of a research station in the Lowveld. To this end Mr H J van Rooyen (MPC, Nelspruit) addressed the Provincial Council in May 1971 as follows: "On behalf of the game farmers I request that the Province undertakes research projects in the area in order to provide farmers with a comprehensive, scientific extension service covering aspects of

DIRECTORATE OF NATURE CONSERVATION

DICK WOLFF

planning, conservation and utilisation in order that cattle farms which are converted to game farms may still be able to make their contribution in the National interest".

The Nature Conservation Committee of the Transvaal Agricultural Union also discussed the proposal and their discussion was later reported in the press.

The vice president of the South African Hunters and Game Conservation Association wrote as follows to the Nature Conservation Advisory Committee with regard to the above:

"It is our opinion that a research station can benefit the game farmers as well as the hunting of certain game species. We would like to assure you of our moral support and would like to inform you that financial support will be seriously considered when progress has been made with this concept."

In June 1971 the Executive Committee of the Provincial Administration approved the establishment of a research station in the Lowveld and a start was made in locating a suitable site. Up till this stage the Lowveld Research Station, as it was known, was located in the Sabie Sand Game Reserve. In 1973 the research station was relocated to a private farm in the Klaserie Private Nature Reserve. The location of a suitable site for the research station was largely left in the hands of Mr A von W Lambrechts and by 1975 a list of 16 possible locations was submitted for consideration. The sites had to meet with certain criteria. They had to be in close proximity to the study area. The terrain had to be suitable for the erection of facilities for use by the Nature Conservation Division's personnel as well as outside researchers and the site had to be easily accessible to the surrounding landowners.

While the Division was busy looking for and evaluating the various terrains, Mr Hans Hoheisen offered a portion of his farm Kempiana, adjacent to the Orpen Gate to the Kruger National Park, as a site for the future research station. Negotiations with Mr Hans Hoheisen concerning the terrain had started as early as 1972. In May 1977 the Executive Committee gratefully accepted Mr Hoheisen's donation and the planning of the future research station began in earnest. The first work on the station commenced in 1978.

In April 1982 the portion of the farm Ross on which the Nature Conservation personnel were temporarily accommodated, was sold and the personnel moved to the new terrain where they stayed in caravans initially. The station was completed in 1983 and on the 15th July 1983 the station was officially opened by Mr Hein Kruger, the member of the Executive Committee entrusted with Nature Conservation, and was named the Hans Hoheisen Wildlife Research Station.

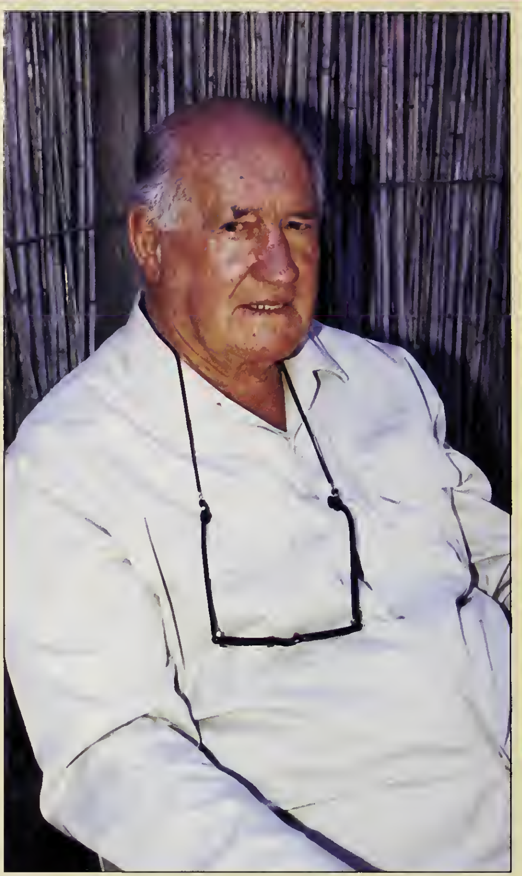
The Hans Hoheisen Wildlife Research Station is approximately 40 ha in extent and adjoins the Kruger National Park at Orpen Gate. It is part of the 14 000 ha private reserve of Mr H O Hoheisen which in turn borders on the Timbavati Private

Hans Hoheisen, one of the big names in the Lowveld, at 82 years of age is still the nature lover and conservationist he has been fifty years ago when he first came to the Lowveld. Today, this is still one of the few nature areas outside the Kruger National Park where lion and elephant freely roam the wild.

Mr Hoheisen is known especially for his endeavours in the field of conservation education. He has twice been the winner of the Ossie Doyer Trophy, Nature Conservation's award for **Nature Conservationist of the Year**, for the major role he is playing in stimulating conservation-awareness. Each year he makes his land available for the use of the Land Service cultural organisation, and the Wilderness Leadership School has been using his land for some time now for their hiking trips.

He believes that both local and overseas visitors have very little knowledge of the intricate and sensitive interactions in Nature and that they should be made aware of this; consequently, a safari company, **Ngala Safaris**, takes tourists on a regular basis on sight-seeing trips on Mr Hoheisen's land. He believes that making tourists enthusiastic about the country one cultivates ambassadors.

He hopes that the good work will continue at the Hans Hoheisen Research Station, and that particular attention will be paid in future to the status of the lion in the Timbavati, since he is troubled about the fact that their numbers are dwindling in that area.


RENÉ JOUBERT

ERROL PIETERSEN

ERROL PIETERSEN

Nature Reserve. There is a free movement of game between these two private reserves as there are no fences between them. A wide spectrum of big and small game is found on the reserve as well as a wide variety of birds and reptiles.

The well equipped facilities of the station comprise four offices, three laboratories, a herbarium, a library and a storeroom for chemicals. There is also an auditorium which can seat 80 people and an adjoining kitchen which can be used for catering.

The aims of the station are multiple:

1. To do management orientated research on all aspects of management of natural areas in the Lowveld.
2. To provide an extension service to the landowners as well as to provide them with scientific information with regard to all aspects of management of natural areas.
3. To make the station's facilities available to researchers outside of the Directorate of Nature Conservation.

To attain the last aim a visitors park has been erected which consists of two mobile homes, an ablution block and a kitchen.

A research priority list has also been drawn up. Outside researchers wishing to do research in these identified fields have first option on the utilization of the station's facilities.

At present research personnel are busy with the following projects:

1. Basic mapping of major plant communities in the Timbavati Private Nature Reserve.
2. Research aimed at the management of elephants outside of the Kruger National Park.
3. The food intake of elephants. This project is being done in conjunction with Prof Meissner of the Pretoria University.
4. Longterm ecological monitoring on the private nature reserves. This includes aerial game census, and the monitoring of ground cover and erosion. The data obtained from these programmes is made available to the landowners for management purposes.
5. A project is also being undertaken by a post graduate student on the food intake of impala.

JANET MATTHEWS

6. Water provision in the Klaserie Private Nature Reserve.
7. Basic map of plant communities in the Klaserie Private Nature Reserve.
8. The experimental release of captive bred cheetahs into a natural habitat.

Projects which the station has completed in the past include the following:

1. Ecology of wildlife in the Sabie Sand Game Reserve.
2. Management research in the Eastern Transvaal Lowveld.
3. Socio-psychological characteristics of game reserve owners in the Eastern Transvaal Lowveld.
4. Bush control on nature reserves in the Eastern Transvaal Lowveld with special reference to chemical arboricide.
5. The ecology of the lion in the Klaserie Private Nature Reserve.

The Research Station has a long and proud history of cooperation with private landowners in the Lowveld, and this is reflected by the above mentioned projects as they were all undertaken on private land with the cooperation and often on request of the landowners.

JANET MATTHEWS

DIRECTORATE OF NATURE CONSERVATION

Game Census

BRIAN REILLY

One of the most important aspects of the management of wildlife of any sort, be it plants or animals, is to determine from time to time HOW MUCH of it is to be managed. Inventories or censusses of this sort are all very well where plants are concerned but animals by the very nature of their survival strategies are adept at not being found and what cannot be found cannot be counted. Wildlife managers and biologists have come up with some unique ways of surmounting this problem and this article will attempt to provide some insight into that most magical of management cliches the *game census*.

The staff of the Transvaal Directorate of Nature Conservation are confronted with a massive problem when it comes to censusing the Provincial reserves. The Directorate have, for example, approximately 30 ungulate species varying in size from Sharpe's grysbok to eland and buffalo. Each and every one of the species differ in their lifestyles and cannot be counted in the same way. The reserves also vary in size from a few hundred hectares to over ten thousand hectares and cover diverse terrain, from the grassveld of the Western Transvaal to the Eastern Transvaal escarpment. There are also marked logistical problems caused by the dispersion of nature reserves over the whole Province.

Available literature covers a variety of census strategies and techniques, and a handy classification is given by Collison (1985). It is both time-consuming and irrelevant in an article of this nature to cover all the census strategies and techniques set out in literature but it suffices to say that all those presented in the dendrogram (figure 1) after Collison (1985) have been proved using sound mathematical and statistical principles.

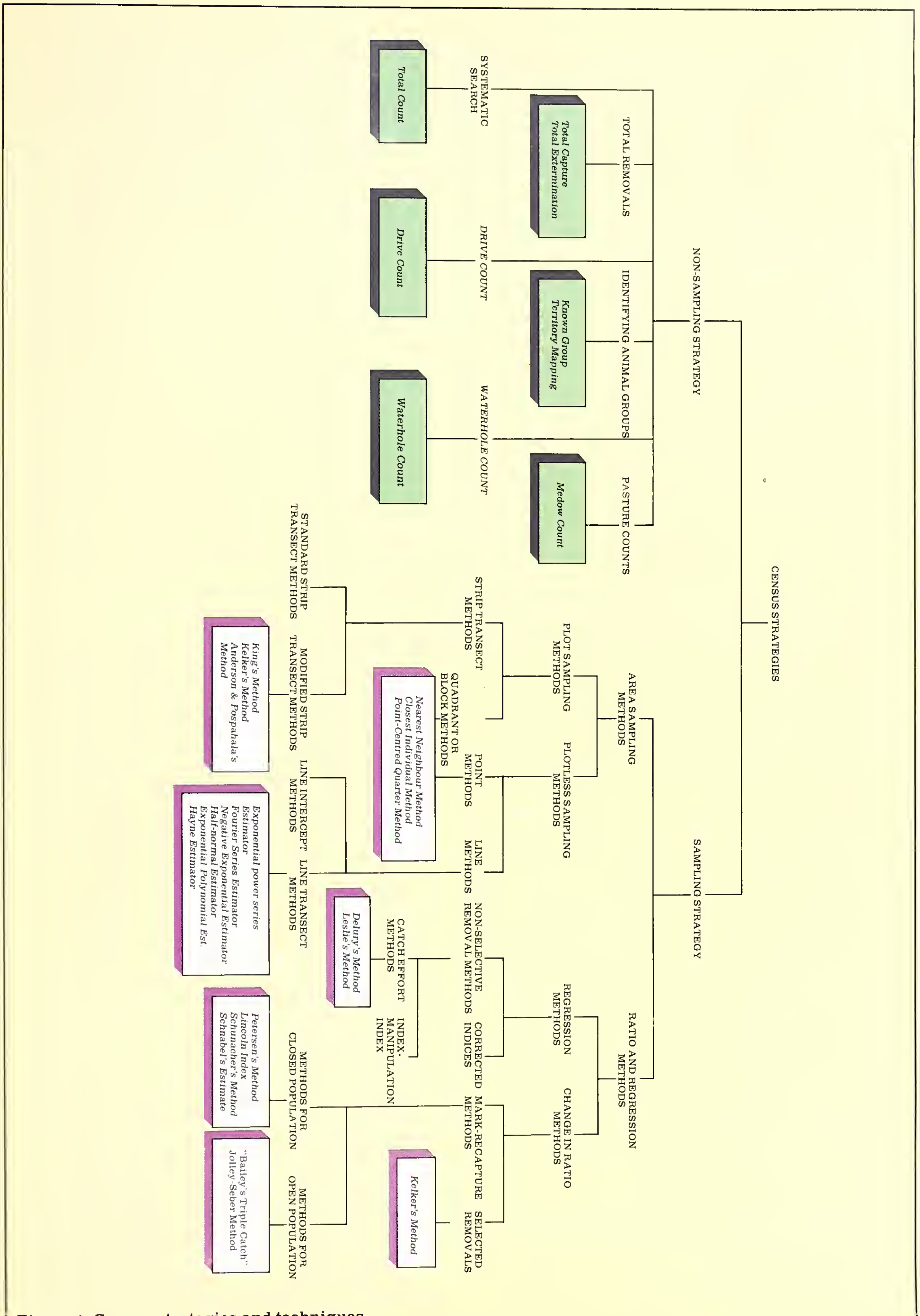


Figure 1: Census strategies and techniques.

What will be covered is the procedure followed by the Directorate in the selection and application of census strategies and techniques on its reserves. A census strategy is the rationale used for estimating animal numbers and of interest, here, are two strategies, *viz.* **the non-sampling strategy** where an attempt is made to find and count all animals in an area, and **a sampling strategy** where only a part of the population or area is counted and the total population figure is extrapolated from that figure.

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Of all the techniques available, how do we go about selecting the appropriate technique for a specific reserve? The first and foremost considerations are the research and/or management objectives for an area. A management objective may, for example, be one of sustained yield while a research objective may be a study of animal habitat preferences. In the first instance an estimate of actual numbers is required while in the second case an index of abundance of some sort will suffice. It is necessary, here, to define **index:** i.e. the result of the exact application of the census technique that may or may not reflect the actual numbers but definitely indicates tendencies in the population.

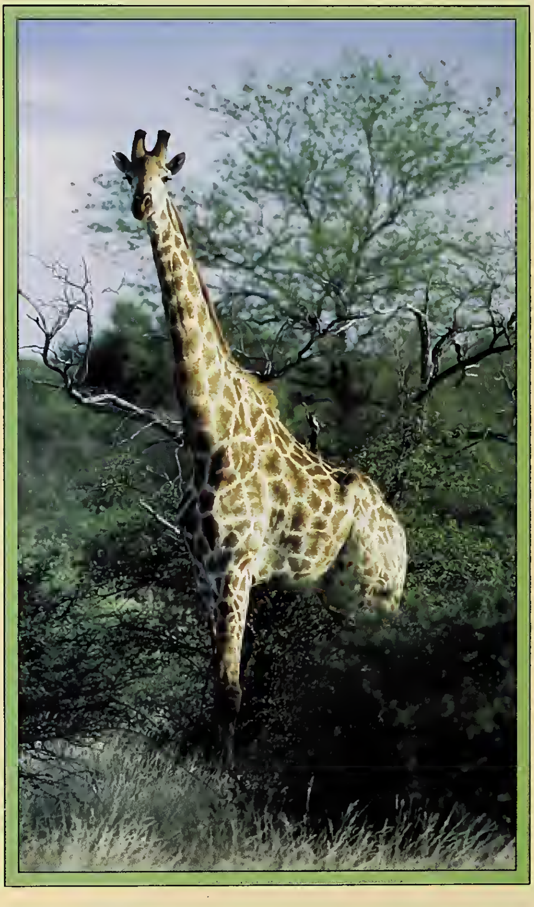
The second aspect to be looked at when preparing a census are the characteristics of the area to be censused. Of primary consideration is the size of the area, though such factors as topography, vegetation, water and man-made features are also considered. The relatively large size of an area may indicate the use of a **sampling strategy**, while a wide diversity of topography and vegetation may make the **survey design** of a **sampling strategy** almost impossible to apply, e.g. Loskop Dam Nature Reserve. The availability of water affects an animal's habitat selection and should be taken into account when choosing a census strategy, in particular when using waterhole counts. Man-made features refer primarily to roads since the availability of roads can be a deciding factor if a choice is to be made between operating from the air or from the ground, viz a vast road network in the Hans Merensky Nature Reserve makes it possible to undertake a **sampling strategy** from the ground.

A third aspect to be considered when selecting an appropriate census strategy and technique is the nature of the animals to be counted. Factors such as colour, mobility, size and population density will affect the selection of a census strategy or technique. The more secretive an animal's behaviour the more biased will be the result of certain census techniques. Some animals are so secretive in their habits that it is easier to enumerate them indirectly — counting their signs rather than the animals themselves, e.g. nyala and bushbuck.

It may sound odd to have to consider population density in planning a census, since after all, is that not in itself the objective of the census? What is meant, here, is a rough idea of the population density, and the rule of thumb is that populations below approximately fifty individuals produce biased results when a sampling strategy is used and, of course, the more gregarious the species the greater the bias. This last-mentioned factor occurs frequently because of the many small reserves run by the Directorate.

Fourthly, an important consideration is the cost of the census, and if the objectives and goals of the census cannot be attained within the estimated cost the relaxing of those objectives should be considered. It stands to reason that the most appropriate technique is that which achieves the goals of the census at the lowest cost. To illustrate this last statement: it is envisaged that helicopter censusing will cost R12 a minute in 1988 and that excludes the time of the operators.

The last and by no means least consideration when planning a census is the expertise and attitude of the operators. Nothing is achieved by



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using unskilled labour with a technique that requires subjective decision-making and has a high risk of violating the **underlying statistical assumptions**. It is thus imperative that the technique chosen is within the **intellectual** and **physical** capabilities of the operators.

Collison (1985) refers to attitude as the frame of mind of the potential user and includes factors such as prejudice and motivation. If the technique is to be applied in respect of a repetitive management objective, decisions and intellectual and physically-taxing techniques should be avoided.

After consideration of all the above-mentioned factors for a specific reserve and the game to be counted, a suitable technique is identified and documented in a census guideline. This guideline is a step-by-step guide enabling reserve staff to maintain continuity in their field data collection. The data are processed using up-to-date computer facilities and ecological programs to produce annual estimates for game on the reserves. Besides the maintenance of this framework of guidelines, specialised techniques are identified and applied to specific problems with certain species, e.g. to count nyala at Loskop Dam Nature reserve. In an effort to standardise the aerial censusing within the Directorate it is the task of a three-man team to undertake all aerial censusing on the reserves of the Directorate.

Nature conservation scientists of the Directorate also undertake in-service-training of reserve staff. They also assist and co-operate with other institutions in the field of censusing.

Although the Directorate strives to keep abreast of technological advances in censusing it must be said that there is no substitute for the careful planning and enthusiastic execution of a game census.

Reference:

COLLISON, R.F.H. 1985. Selecting Wildlife Census techniques. Monograph no 6. Institute of Natural Resources. University of Natal.

Game Capture

DICK WOLFF

RICHARD SMITH

Game translocation, i.e. the capture and distribution of live game, became an important conservation action in this country which, by the mid 20th century, had depleted its wildlife resources to such a state that only remnants of a once vast wealth of game remained.

The Transvaal Directorate of Nature Conservation first began to experiment with the capture of live wild animals in the early 1950's. The development of expertise in capturing game primarily was necessary so that viable breeding nuclei of fast disappearing wildlife could be translocated to Provincial Nature Reserves. Once established it was hoped that the herds would increase in number, enabling the Directorate to relocate species in those areas where they had once teemed.

The techniques employed during this experimental phase of game capture were unsophisticated, and stories abound of men who, often equipped only with a trusty steed and a length of rope, set out to achieve the impossible. Losses among the game they captured were great, but when knowledge is limited any success is an achievement and they laid the foundation for bigger things to come.

For several years capturing was done by staff taken from fields ranging from law enforcement to farm management. They formed a colourful band of men who, for a couple of months in mid-year, travelled about catching game by day and warding off the winter chill by night around the camp-fire, often with something a little stronger than coffee.

As time went by it became evident to the authorities that there was more to game capture than met the eye, and a more professional approach was necessary if success was to be achieved. Rather than take staff away from stations that would then be unmanned, it seemed sensible to form a permanent unit which would specialise in game capture and benefit from the knowledge and experience gained, advantages lost with the change of staff each year.

Just such a unit was formed in 1965 and consisted of a group of three officers, assisted by labourers, stationed at the Percy Fyfe Nature Reserve in the Northern Transvaal. This reserve was chosen since it is situated centrally with regard to the most likely places for game capturing. This reserve also became a breeding station for rare animals such as the roan antelope, the tsessebe and the sable antelope.

Although a permanent unit was formed, this did not completely solve the staff problem. The nature of the work was such that officers were away from home for long, irregular periods. Few officers were prepared to commit themselves to this lifestyle for more than a couple of years before wanting to settle down.

The situation, though not ideal, was infinitely better than it had been, and capture results started to become more positive.

The Transvaal Directorate of Nature Conservation runs some 49 Provincial reserves. Twenty of these now have game populations large enough to follow translocation to other areas. An objective of the Directorate is the preservation of representative populations of all species; consequently, the Transvaal reserves probably possess the broadest spectrum of large mammals in the Republic.

The Game Capture Unit became proficient at handling various small and large mammals, and at present the list of species periodically made available for relocation consists of twenty-eight mammal species ranging from rhino, buffalo and giraffe to duiker and steenbok. The more common species such as zebra, wildebeest, kudu and impala abound in reserves and they, and also some more rare animals, are made available for resettlement on private land in areas where they once occurred.

The names of farmers whose properties have been inspected for suitability of a certain species are added to a waiting list and when such game becomes available, it is translocated to the farm. Although there is a fee involved for the acquisition of game, it only covers the cost of translocation as the Province is a non-profitmaking body rendering a service in the interests of conservation.

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The evolution of game capturing techniques had its origin not in any of the present-day conservation organisations, but in primitive man's need to trap wild animals. Game was a source of food and because early man's weaponry was unsophisticated and because he could not hope to compete physically, he had to learn to outsmart them by trapping them. In order to do so, a knowledge of game and their habits was essential, then as now, only now the objectives have changed.

In our game capture task we aim not to harm the animals in any way. Direct physical injury is avoided, but no matter how careful capture is done, it remains a traumatic experience for a wild animal, stress and shock can just as easily lead to the loss of an animal as physical injury.

Game capture may be divided into two methods: **Chemical capture** and **Mechanical capture**, and both methods are employed by the Directorate.

Chemical capture is used mostly when specific individuals must be caught. This is done by immobilising the animal with a drug administered by means of a dart. The dart, a modified hypodermic syringe is fired from a weapon, and enables the capturer to give the animal an injection at long range. Darting equipment has evolved over the years and the whole range of products are now on the market. Range and accuracy are the two most sought after properties of good darting equipment. The darts, which are much larger and travel more slowly than a bullet, can be affected by the slightest breeze. Certain parts of the animal's anatomy are more suitable targets and so a degree of accuracy is essential.

PETER BANCHIEVY

Approaching the animal to within the range of a dart is an art and patience is required of a capturer dealing with wild animals. The advantage of chemical capture is that it can be done throughout the year, and one can select according to sex and age.

Specific animals can be caught and removed from a herd without putting the remaining animals under undue stress. Game captured in this way are not necessarily meant for translocation.

Injured or sick animals may be captured thus, also animals to be marked for a research project. While under this anaesthetic the animal is manageable and once a specific task has been performed or the animal put in a crate, an antidote is administered to counteract the effects of the immobilising drug, and the animal is roused.

This capture method naturally requires a lot of expertise on the part of the capturer, since the drugs used can be dangerous, and the handling of an animal under an anaesthetic requires a certain skill only gained through experience, which can be likened to the skill of an anaesthetist handling a patient undergoing surgery in hospital.

Mechanical capture accounts for the majority of game caught, and includes such methods as plastic bomas or funnels, drop-nets and net-guns. The latter two methods are less frequently used while the former, the plastic boma, is the common method used to safely capture thousands of head of game each year.

The net-gun which was designed and developed in new Zealand for catching deer in remote and inaccessible mountain areas is sometimes used in this country.

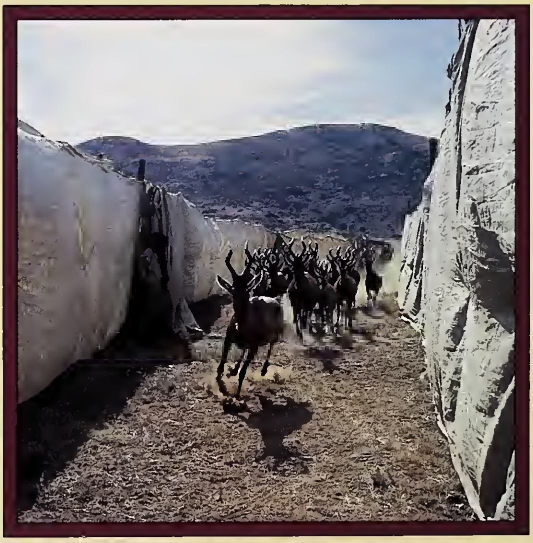
The model used by the Directorate is a hand-held weapon, a modified rifle which fires blank cartridges. The gas released expells weights from several barrels which in turn draw open a net which is thrown forward over the target rather like a mini-parachute. The net envelops and entangles the animal, thus capturing it. The device is normally fired at close range from a helicopter flying low over the target. Only one animal is caught at a time, as each ensnared captive has to be freed carefully and put in a crate. This method is more suitable for small and medium-sized game species.

Drop-nets can capture more than one animal at a time, but like the net-gun much handling is required and animals can be injured in the process.

Nets up to thirty metres in length, standing two metres high and usually with a mesh size of between thirty and forty centimetres are set up in staggered rows at the chosen capture site.

Either beaters or vehicles, but usually a helicopter, is used to drive game into the nets which drop or collapse over them, ensnaring them until they are removed physically and put in crates. Subduing and handling game in this fashion is done less frequently since other methods have been developed and perfected.

The plastic boma, or funnel, has undergone many modifications since its inception twenty years ago, but the principles are the same. A large mobile funnel of opaque plastic sheeting, three


LORNA STANTON

DICK WOLFF

metres high, is erected in a suitable area. Game are driven into the wide end of the funnel which is then closed behind them by drawing curtains of the same plastic material across the entrance. As the game move towards the narrow end of the funnel, more curtains are drawn behind them, thus progressively enclosing them in a smaller and smaller space until the funnel narrows into a passage leading to some container or other. This may be a holding pen or, if the game are to be removed immediately, a crate on a transport vehicle.

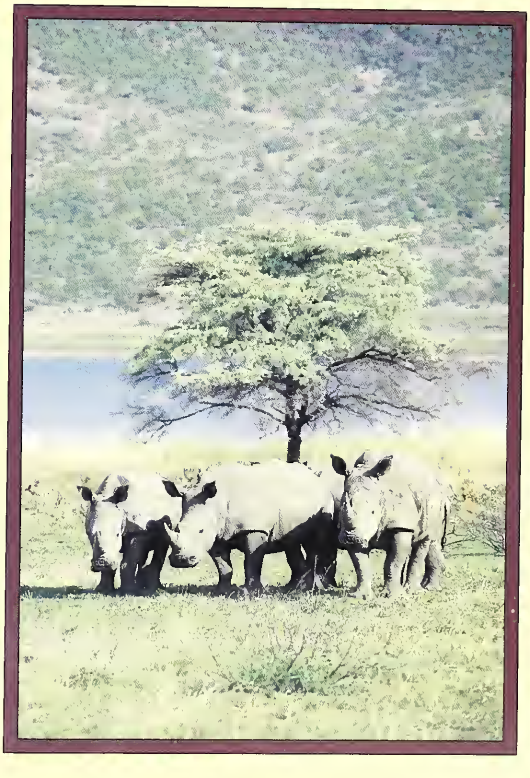
The system works because the game, being unable to see through the plastic sheeting, regard it as a solid wall and seldom attempt to break through, even though the larger species would be able to do so with ease.

Most game is successfully captured by this method. Physical handling is almost entirely absent. Injuries are minimised and if the system is correctly employed shock and stress are negligible.

Modifications to the boma are made to accommodate different species, all of which react differently in stressful situations. Even individual animals of the same species show traits deviating from the norm, and the game handler constantly has to watch out for any snags that may arise. Problems have to be anticipated as this is one type of job where the adage of prevention being better than a cure cannot be overstated.

A good team with a thorough knowledge and a "gut" feeling for the work is essential. Timing is critical in a situation where a decision made only seconds ago can be nullified by an entirely new chain of events.

The Transvaal Directorate of Nature Conservation has a proud record of effective game translocation, a task which is at once a science and an art. For more than a decade now, the game mortalities experienced during capture operations have varied between the one and two percent level with the exception of one year when the figure was as high as four percent. Hundreds of satisfied recipients of game inside and outside the borders of the Republic bear witness to the success of this on-going program designed to return the status of our game to its former glory. Perhaps, above all, the enormous growth within the wildlife industry, the ultimate saviour of our game, is indicative of the effectiveness of game capture and relocation.


LORNA STANTON

ORNA STANTON

Game Utilisation

DANIE BRITS
WERNER HERSELMAN

From time immemorial man has been hunting game. When the Whites came to South Africa they started to exploit game on a large scale. Large herds of game were available everywhere and everybody used to shoot as many animals as he liked for venison, biltong, skins, and so forth. The probability that the apparently inexhaustible source could ever be exhausted was never considered.

When the Dutch founded the first settlement on the coast of South Africa the countryside teemed with a large variety of mammals. Elephant, hippopotamus and lion were found at the foot of Table Mountain. Innumerable herds of wildebeest, springbok, bontebok, eland, zebra and quagga grazed the plains. One of the first descriptions of this wealth of wildlife appeared in a report of Carel Brink about his expedition to the Orange River in 1761:
"On the plains we saw large herds of a wide variety of game, such as rhinoceros, giraffe, buffalo, wild horses, donkeys, quagga, kudu, gemsbok, hartebeest, as well as numerous Auer oxen (eland, perhaps), an animal that looks like an ordinary ox but is heavier and has an ash-grey colour." (Translated)

Today, only about 300 years later, little is left of that rich heritage. The authorities had to take action to control the continuous over-utilisation of game, especially the rarer species, by means of legislation, in order to offer the animals a better opportunity to survive.

The utilisation of game in nature areas has become an economic asset that in some respects offers a stimulus for and means of conserving the indigenous flora. Thus, game utilisation may make a considerable contribution to nature conservation, provided the enterprises concerned are properly run, in order to ensure that malpractices do not destroy the natural resources. The International Union for the Conservation of Nature and Natural Resources (IUCN) accordingly defines the concept of *nature conservation* as follows: "Nature conservation entails the conservation of species variety, and the unfailing judicious utilisation of the renewable natural resources."

In the Transvaal the utilisation of game takes place in the form of hunting for venison or biltong,

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or in the form of trophy hunting, or in the form of catching and selling live game.

The hunting of game for biltong is, perhaps, the most popular and best known form of game utilisation. Hunting for such a purpose is usually undertaken by local sporting hunters or social hunters for a consideration. This form of game utilisation, though, is not necessarily the best paid form.

The aesthetic and domestic utilisation of game is just as popular as hunting for biltong, although it has few financial advantages (Liversidge, 1983).

Trophy hunting is the most profitable form of game utilisation, but it is totally dependent on overseas clients. However, an exceptionally high standard of service to the client is necessary, and trophy hunting also requires a large variety of game species on the farms concerned (Holiday, 1985).

Although, previously, the live game trade was undertaken mainly by the different nature conservation bodies, the larger producers nowadays catch and sell their game themselves. The sale of live game is gaining in popularity and good prices are paid for the popular and rare species (Koch, 1982).

The hunting of game for venison is also a form of game utilisation. However, a big domestic market for venison does not exist. This may be attributed to the fact that few South African housewives know how to prepare and dish up venison (Visser, 1983).

South Africa's biggest market for venison is in European countries such as Switzerland and Germany where it has to compete with the venison of deer and European small game. The venison of South African small game such as young blesbok, impala and springbok is very popular because Europeans prefer cooking a whole leg or rib. The venison of the larger antelope such as kudu and eland is not as popular and it is diced and used in pies.

Several organisations are involved in game utilisation in the Transvaal, for instance the National Parks Board, the Provincial Adminis-

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tration, municipalities and private bodies. Private land owners probably are the people who can exploit game to the best advantage for themselves.

Certain legal requirements must be met in respect of game utilisation in the Transvaal. Game have no owner until they are taken into possession by somebody, either by catching the animals or hunting them. If the animals return to the wild (e.g. by letting them go or if they escape), they again have no owner. The Provincial authorities are authorised by the Constitution to determine, by means of ordinances, the conditions, restrictions and provisos in terms of which a person may gain a certain right of disposal over game (Bigalke, 1964).

The Transvaal Nature Conservation Ordinance, 1983 (Ordinance 12 of 1983), distinguishes between *protected game, protected wild animals* and *ordinary game.*

Protected game are animals that are very few in number, consequently needing strict protection. Such game may be hunted only in exceptional cases.

Protected wild animals are animals that also need strict protection, but they may be hunted by farmers under certain circumstances, mainly when they cause serious damage to property.

Ordinary game are animals occurring in such numbers that they may be hunted during a certain open season. An **open season** is annually declared by the Administrator before 30 April by notice in the **Official Gazette of the Province of the Transvaal.** Persons mentioned in the notice may, subject to the conditions of the Ordinance, hunt such species and sexes of game that are mentioned therein and are found in the area mentioned therein.

Trophy hunting undertaken by overseas hunters is controlled by regulation in terms of the Transvaal Nature Conservation Ordinance. A foreign client (trophy hunter) is not allowed to hunt wild or indigenous animals in the Transvaal for a consideration, unless the hunting trip was organised by a hunting outfitter and the client is accompanied by a professional hunter. Consequently, hunting outfitter and professional hunter must both have permits that are issued only after they have passed a test set by the Provincial Administration. The hunting outfitter is the person who organises the hunting trip. He is responsible for all arrangements concerning the trip. He provides the hunting area and has to make sure that the species of game his client wishes to hunt are available in that area. Often, the hunting outfitter also acts as the professional hunter, accompanying the trophy hunter in the veld. The professional hunter looks after the safety and comfort of his client during the actual hunt and also when they are in the hunting camp. He also has to see to it that his client hunts in compliance with the provisions of the Ordinance. He may, accordingly, give lawful instructions to the client.

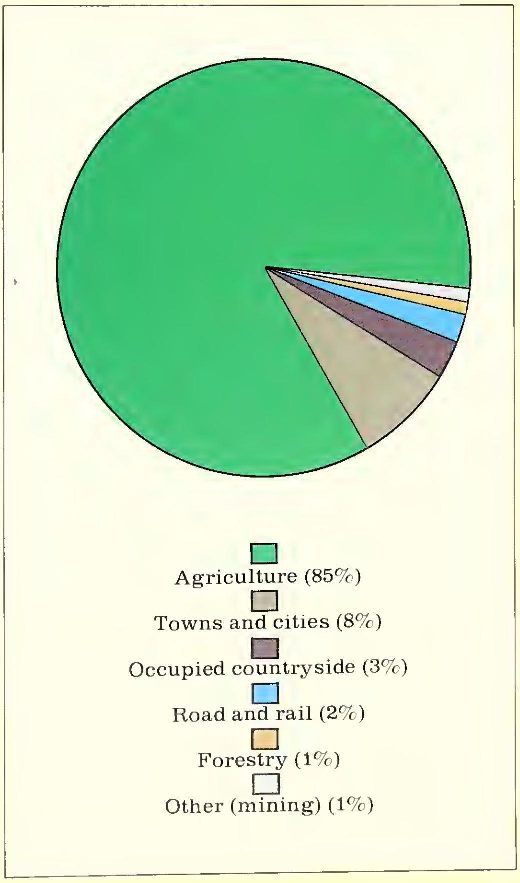
Game farmers may obtain exemption in respect of their farms. Such a permit exempts the farmer from all or any of the provisions of the Ordinance regarding the hunting, catching or selling of the game species mentioned in the exemption. However, the land concerned has to be fenced in according to specifications in such a manner that the species concerned will not be able to leave or enter from the outside.

In respect of rate and endangered species the number of animals and the size of the camp in which they are found are taken into account before exemption is granted.

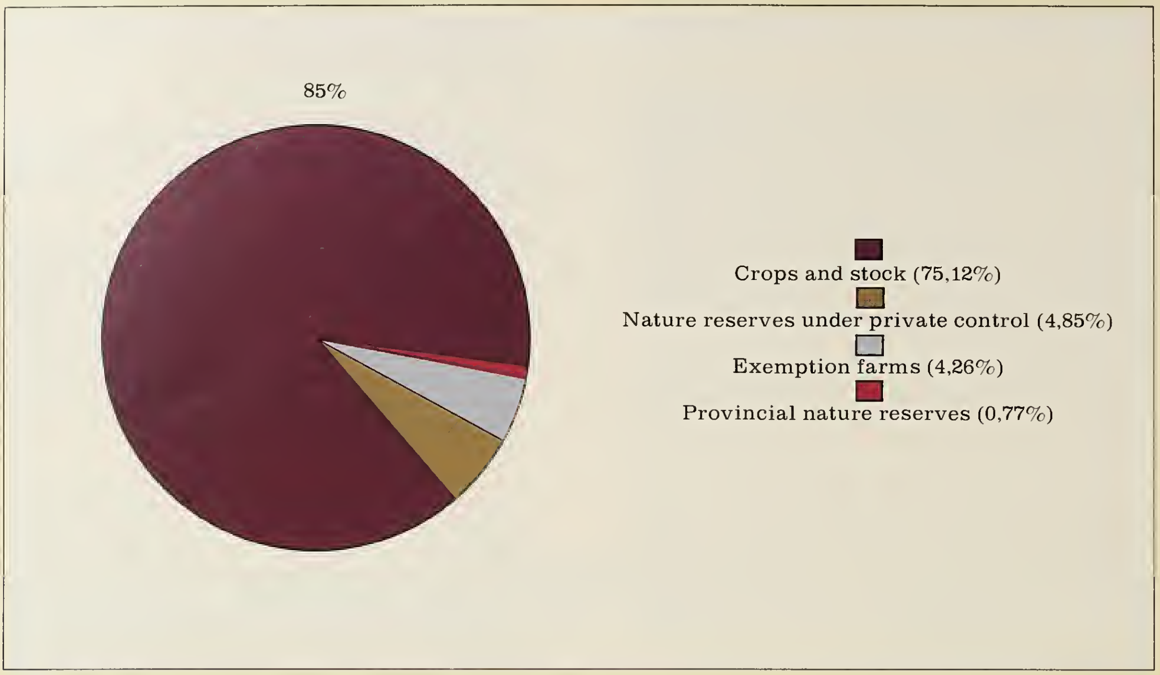
Furthermore, the holder of an exemption is authorised to grant written permission to other individuals, subject to the provisions of the exemption, to catch, hunt or sell the species of game mentioned in the exemption on the exempted land. A farm in respect of which an exemption has been issued to the owner is generally referred to as an **exemption farm.**

A research project regarding the extent and nature of game utilisation in the Transvaal was recently completed by the Directorate of Nature Conservation. It brought interesting facts to light.

With the exclusion of the self-governing territories, the independent states and the Kruger National Park, the Transvaal covers an area of approximately 263 432 km². Land use in that part of the Transvaal is divided as follows:



The use of agricultural soils are subsequently further subdivided:



The veld of the Transvaal is divided into 24 main types (Acocks, 1975), eighteen of which were found in the survey under discussion. When those veld types were divided into three groups it appeared that 57 per cent of the game farms were in the Bushveld, 28 per cent in the Lowveld and 15 per cent in the Highveld. It was also found that exemption farms in the Transvaal, in total, covered an area of 1 123 104 ha at the end of 1986, private nature reserves 1 277 912 ha, and Provincial nature reserves only 202 308 ha. Ergo, the vast majority of nature areas are privately owned.

In the 1985/86 period licences were issued for the hunting of approximately 32 035 animals representing 36 different game species. Hunting on exemption farms is not included in this figure, since licences are not necessary for such hunting.

In the research into game utilisation it was found that there were a total of 711 exemption farms (with a total area of about 11 231 km²) in the Transvaal at the end of 1986. The farms varied in size from 60 to 19 000 ha, and the average size was about 1 579 ha. Most of the farms (65 per cent) were situated in the districts of Alldays (22 per cent), Thabazimbi (19 per cent), Ellisras (14 per cent) and Pietersburg (11 per cent). At present (1988), there are about 1 200 exemption farms in the Transvaal.

The distribution of such animals as kudu and impala in the Transvaal is exceptionally good. Kudu are found on 92 per cent and impala on 88 per cent of the exemption farms. Tsessebe, buffalo and black wildebeest are sparsely distributed and are found on only 10 per cent of the exemption farms. Grey rhebuck are found on only five per cent and roan antelope on a mere three per cent of the farms.

Although game are culled throughout the year, the peak time for culling is in the months of May, June and July when 68 per cent of the owners do their culling.

The game species singled out in particular for annual culling is impala, followed by blue wildebeest, blesbok and kudu. Other species such as rhinoceros, tsessebe, grey rhebuck, mountain reedbuck and reedbuck are exploited in very small numbers.

In the culling of game, male animals were usually picked out, except for giraffe and buffalo where an equal number of both sexes were culled, and reedbuck where more ewes were culled.

In culling mainly adult animals were picked out. Only giraffe, buffalo and reedbuck were culled on sight, regardless of the age of the animal.

The owners of the farms culled their game themselves in 46 per cent of the cases, but in 37 per cent of the cases game were culled by hunters, in 11 per cent by contractors and in six per cent by managers.

In the culling process 53 per cent of the farmers use vehicles, 18 per cent well-equipped abattoirs, 12 per cent cold rooms on the farm and one per cent two-way radios. Fourteen per cent of the farmers did not have any equipment on the farm and use only the services of contractors.

The carcases of culled game were used for biltong (39 per cent), by butchers (18 per cent), by the owners themselves (16 per cent), by contractors (nine per cent), and by abattoirs (two per cent). Ten per cent of the cases did not specify uses.

On 32 per cent of the farms the owners make provision for trophy hunting. Facilities on such farms vary from where a hunter is completely self-sufficient to where five-star comfort and luxury are offered and everything is laid on for the hunter.

Trophy carcases were used as follows: 56 per cent in respect of the owner himself, 21 per cent in respect of the trophy hunter, four per cent in respect of the hunting outfitter, and 19 per cent not at all.

Trophy carcases used by the owners themselves were meant for their own domestic use (34 per cent), biltong (32 per cent), butchers (16 per cent), private persons (four per cent), contractors (four per cent), canning (two per cent), and other uses (eight per cent).

Game-catching operations are very successful — only a small percentage die after being caught. Losses sustained in respect of zebras were only one per cent, sable antelope eight per cent and giraffe nine per cent. The prevention of losses, seen economically, has to correlate with the value of the game species concerned. Most of the land owners (62 per cent) use contractors for the catching of their game, while the rest (38 per cent) do it themselves.

Game caught were mainly impala, blesbok, zebra and kudu, while no rhinoceros, wart-hog, tsessebe, buffalo, roan antelope, grey rhebuck or reedbuck were caught.

The marketing of the game was undertaken by the owners themselves and by contractors at public auctions. Owners also exchanged game among themselves.

JANET MATTHEWS

DICK WOLFF

Prices paid for game rose considerably during the past eight years. Impala and kudu reached average prices of R50 and R182 respectively during 1979 (Koch, 1982), while during 1987 they reached average prices of R125 and R467 respectively. Roan antelope were sold at an average price of about R2 143 at game auctions during 1979, but reached R7 000 in 1987.

In the 1987/88 period game prices increased even more. In this year impala were sold for R230 to R350 and kudu for R1 000 to R1 450, while sable antelope reached staggering prices of R10 000 to R12 000 each. Roan antelope sold at average prices of about R22 500 per animal.

Losses of purchased animals refer to losses sustained during the transportation and offloading of the animals and during a period of seven succeeding days, since game are usually sold under the following conditions:

— The seller has to catch his game and, if necessary, keep them under quarantine at his own risk.

— The buyer of the game has to transport and translocate the game at his own risk (unless specifically arranged otherwise).

In terms of numbers major losses of purchased animals were sustained in respect of gemsbok, red hartebeest and blesbok, while in terms of percentages major losses were sustained in respect of roan antelope — three of the eight animals purchased, i.e. 37,5 per cent, died. Quite big losses were also sustained in respect of reedbuck and buffalo purchased, *viz.* 28,4 and 26,9 per cent respectively. No losses were indicated in respect of grey rhebuck.

Game utilisation has many advantages for nature conservation, since large tracts of land are conserved because they are used as game farms. Such land would otherwise have been used for agricultural or other purposes, and would have been lost for ever to nature conservation. Furthermore, game culling is necessary nowadays in most nature areas to prevent the over-utilisation of the environment. Over-utilisation leads to numerous problems such as erosion, bush encroachment and changes in the composition of plant species which, naturally in turn, lead to the deterioration of game populations. Game utilisation is therefore, an economic asset as well as an "aid" in nature conservation.

DIRECTORATE OF NATURE CONSERVATION

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RICHARD CARR

Rare and Endangered mammals of the Transvaal

The over-exploitation of South Africa's natural environment, and its terrestrial habitats in particular, has been the major reason for the decline of many mammal species during the past century. In addition some species are perceived to be a threat to some agricultural practices because of their direct competition for grazing, as stock killers and the possible spread of disease. Some species are inadvertently killed because the agriculturalist and the industrialist are not aware of their presence or because they are not thought to be of any value to mankind. The nature and extent of various forms of environmental over-utilization have been dealt with in some detail by the previous authors.

In South Africa man's activities have already lead to the documented extinction of species such as the Cape lion, the bluebuck, and the quagga. However it is not known how many other species have become extinct without ever being known to science. Research into the ecological requirements of all mammalian species is therefore fundamental to successful nature conservation.

The Directorate of Nature Conservation is therefore involved in various forms of mammal research aimed at determining the size and distribution of all mammal populations in the Transvaal, the nature and extent of the threats to their survival and experimenting in ways to protect and conserve the most threatened species and populations. This research is done in association with other scientific bodies such as universities, museums and institutes and the Directorate values the assistance rendered by numerous conservation orientated organizations.

The formation of Provincial Nature Reserves is only one way of protecting threatened mammals. Many species can not be offered sufficient protection in this way because of their large home ranges, low population densities or nomadic habits. The high cost of purchasing land for conservation is another consideration. For the successful conservation of many mammal species the cooperation of private landowners is essential because the greater part of the Province is privately owned. In many instances the largest population of threatened mammals occur on private land.

In order to direct limited funds and manpower towards areas of greatest need a ranking system for the various species is needed. In the early 1960's the idea of listing threatened species in a "Red Data Book" originated within the International Union for the Conservation of Nature and Natural Resources (IUCN), an international organization based in Geneva, Switzerland. The intention of red data books world-wide is to synthesize information on rare and threatened species and to draw up a priority listing.

The South African Red Data Book — Terrestrial Mammals (Smithers, 1986) is the second edition of this publication and lists a total of 92 species in the Republic, 55 of which occur naturally in the Transvaal. These threatened mammals are grouped in six internationally recognised categories according to their vulnerability. The categories are as follows:

LORNA STANTON

Extinct: Taxa which are known to have become extinct since the arrival of the first settlers in the Cape in 1652, and for which a historical record exists.

Endangered: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue to operate. Included are taxa whose habitat has been so seriously diminished in size and/or degraded that they are deemed to be in danger of extinction.

Vulnerable: Taxa likely to move into the endangered category if the causal factors continue to operate.

- Included are taxa whose populations are all or nearly all decreasing owing to habitat destruction, over-exploitation or other environmental disturbances;
- taxa with seriously depleted and insecure populations;
- taxa with still sizable populations endangered on account of serious adverse factors present throughout their whole range.

Rare: Taxa with small populations not at present endangered or vulnerable but at risk. These taxa are usually localised within geographically restricted areas or habitats or sparsely distributed over an extensive range.

Out of danger: Taxa formerly considered to be endangered, vulnerable or rare but now considered to be relatively secure because of effective conservation measures.

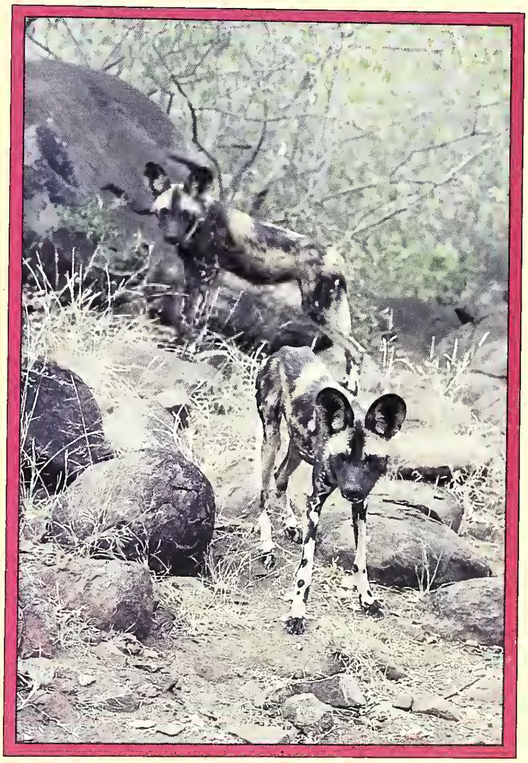
Indeterminate: Taxa which may be worthy of inclusion in any of the above categories but whose status cannot be determined because insufficient information is currently available on which to judge their status.

Endangered

Two Transvaal species fall into this category.

Wild dogs *Lycaon pictus* are now restricted almost entirely to the Kruger National Park (KNP) and private nature reserves on its borders. However, small packs occasionally move out of these areas into the extensive cattle-ranching areas in the vicinity of Gravelotte, Mica and Hoedspruit. Wild dogs are also occasionally encountered in the Messina and Alldays districts, infiltrating from Zimbabwe and Botswana. All these invariably prey on domestic stock, thereby alienating otherwise conservation-conscious landowners. Such packs either return to the areas they came from or are killed by the local farming community. Wild dogs are classed as protected wild animals (Schedule 4 of the Nature Conservation Ordinance, No 12 of 1983), and as such may be destroyed by a landowner under the conditions stipulated by the Ordinance. The nomadic habits of wild dogs unfortunately preclude their introduction to most private nature reserves because their home ranges are usually in excess of 400 km². The status of this species is unlikely to improve in future because of its incompatibility with agricultural practices.

Roan antelope *Hippotragus equinus* is the other Transvaal species in this category. Roan historically occurred as scattered and discontinuous populations throughout the bushveld regions of the Transvaal and into the Northern Cape wherever suitable habitat existed. Roan require areas of seasonally saturated grassland within a bushveld biome, and because of their generally rare habitat, they are particularly sensitive to competition from other grazers, cattle in particular. Today roan have disappeared from all but a handful of farms on the Waterberg Plateau and that population is by no means secure. In the early 1960's the Directorate captured 16 roan in this area and introduced them to the Percy Fyfe Nature Reserve, and when their numbers increased sufficiently, nucleus herds were distributed to other Provincial reserves and to private owners. Currently, approximately 560 roan occur in the Transvaal, 150 on the Directorate's reserves, 330 in the KNP and 80 on 12 private properties. The future of this species in the Transvaal is optimistic.



JANET MATTHEWS

Vulnerable

Ten species in the Transvaal are considered vulnerable.

The rough-haired golden mole *Chrysospalax villosus* is about 15 cm in length and has a characteristic golden, reddish-brown sheen in its fur. This mole is unusual in that it does not make subsurface runs like other golden moles, but excavates burrows which it leaves open while out foraging for insects and earthworms, usually after rain. The rough-haired golden mole is found only at a few localities in the Transvaal near Pretoria, Lydenburg, Belfast and Wakkerstroom. These golden moles inhabit meadowlike grasslands bordering marshes where they are in danger when fields are ploughed for cultivation. Golden moles are most active after rains when tunnelling is easy, their prey is then active too.

JANET MATTHEWS

The white-tailed mouse *Mystromys albicaudatus* is a grassland rodent measuring 22 cm in length and weighing 78-96 g. Although found throughout the Transvaal Highveld grasslands their population numbers are low. These mice prefer areas with a dense grass cover on sandy soil. They dig burrows up to 46 cm deep and also utilise deep cracks in turf soils. Like all rodents they feed on seeds and vegetable matter and sometimes insects. *Mystromys* is a relatively slow breeder producing litters of two to five young all year round. Shortly after birth the young attach themselves to the female's nipples, clinging there permanently for a full three weeks and thereafter intermittantly during their weaning time of up to 38 days. During this time the female continues to forage normally.

The honey badger *Mellivora capensis*, a solitary and predominantly nocturnal mustelid, has been recorded at numerous localities throughout the Bushveld and Lowveld. It occurs in a wide range of habitat types. Because of its nocturnal and solitary habits it is difficult to establish the population size and it is not known whether its numbers are in fact declining. Honey badgers apparently require fairly large areas and are therefore not easy to protect on small nature reserves. Their conservation status is unlikely to improve until more research into their ecological requirements and movements has been undertaken.

The African wild cat *Felis lybica* is found in most regions of the Transvaal but, because of its solitary, nocturnal and secretive habits very little is known about the population size and status of this species too. It is considered vulnerable because of its tendency to cross-breed with the domestic cat. Characteristically, such hybrid cats do not have the long legs and reddish ear-backs of the pure-bred *F. lybica*.

The antbear or aardvark *Orycteropus afer* is the only surviving relative of the order *Tubulidentata*, an order with a fossil record originating 15-20 million years ago from in the Miocene beds of East Africa from whence the antbear spread to Europe, Asia and Madagascar, becoming extinct there about 3 million years ago. The aardvark now occurs only in Africa south of the Sahara where it is widely distributed but nowhere common. Its solitary nocturnal habits make it a difficult animal to study. There is at present no evidence that the aardvark's numbers are declining in the Transvaal, but elsewhere in the Republic declines have become apparent, thus justifying the status given.

The sable antelope *Hippotragus niger*, a close relative of the roan, has shown a satisfactory growth in numbers within the past decade. A survey conducted in 1985 revealed that 1 400 sable occur in 90 localities in the Transvaal outside the KNP, and the population is steadily increasing. This satisfactory state of affairs is almost entirely owing to the popularity of this animal with the game-farming and safari hunting communities. For example, a group of landowners in the Letaba district has formed a sable study group and is attempting to maximise the productivity of their sable herds by applying ecologically sound veld management techniques. Extremely high prices are paid annually at game auctions for sable breeding stock. Sable antelope is very popular with overseas trophy hunters. The high economic value of this species will undoubtedly ensure its survival in the Transvaal.

The pangolin *Manis temminckii* probably is the least known medium-sized mammal in Southern Africa. Information about its habits is limited to the observations of only a few of biologists. It is an extremely shy and retiring animal and appears to be predominantly nocturnal, which exacerbates the problem of research. Possibly the greatest threat to this animal is the fact that there is a demand for parts of its body for making muti. Being relatively slow moving and totally defenceless against man it is easily killed. Sightings of pangolins have been made mainly in the north-western bushveld areas, north of the Soutpansberg and in the KNP.

LEON NELL

In the Transvaal oribi *Ourebia ourebi* are confined to grassland areas of the South-eastern Transvaal and escarpment. Within these areas their distribution is patchy and discontinuous. Their habitat consists of flattish grassland areas with short to medium grass and suitable cover

PETRI VILJOEN

in the form of rocks and shrubs or taller grass patches. Many oribi are killed by domestic dogs and another threat is the destruction of their habitat through various agricultural activities and afforestation. These small antelope occur on six Provincial Nature Reserves and total approximately 150 individuals. This population is considered to be stable.

The Transvaal's smallest antelope, the suni *Neotragus moschatus*, is also its rarest. It occurs only in an isolated patch of sand forest in the northern KNP, with unconfirmed sightings in the Golela Bush, an extremely dense scrub forest in the Pongola Nature Reserve. Suni are active mainly in the early morning and late afternoon and when disturbed take cover in dense vegetation. They are browsers, feeding on the terminal leaves of shrubs and the fallen and growing fruits of trees and shrubs. They appear to be independent of drinking water. The Transvaal's limited population is not threatened and is most probably stable. Suni are threatened in Natal, however, through habitat destruction, which justifies a status of vulnerable.

Rare

Nineteen species of Transvaal mammals are placed in this category.

The South African hedgehog *Atelerix frontalis* occurs in such a wide range of habits that it is difficult to assess its requirements. It occurs in suburban gardens, in the bushveld, and on Highveld grasslands with a 300-800 mm mean annual rainfall. Hedgehogs require a plentiful supply of insect and other invertebrate food and dry cover in which to rear their young. They are mainly nocturnal but have been known to be diurnally active after light showers of rain, especially early in the season. Their well-known defence mechanism of rolling into a ball is quite effective. They are preyed upon by the giant eagle owl *Bubo lacteus* and sought after as "muti". They are also sometimes kept illegally as pets.

The yellow golden mole *Calcochloris obtusirostris* is confined to the extreme north-eastern parts of the Transvaal in the Pafuri area of the KNP, and to northern KwaZulu. It lives in subterranean burrows like other golden moles, frequenting light sandy soils, sandy alluvium and coastal sand dunes. Very little is known of this species' biology and since its distribution in the Transvaal is restricted to a national park it is unlikely to be threatened.

The distribution of the four-toed elephant shrew *Petrodomus tetradactylus* is similar to that of the previous species. In the Transvaal it is found only in the riparian forest of the Limpopo and Levubu Rivers and in the Lobombo ironwood *Androstachys johnsonii* forests in the Pafuri area of the KNP. It also occurs marginally along the Limpopo River westwards to Beit Bridge. Diurnal and terrestrial, four-toed elephant shrews are seen singly or in pairs, resting in holes under tree roots, in termite mounds or under logs. They follow well-used paths and, because of their saltatorial mode of locomotion, such a path consists of a series of bare patches in the ground litter caused by their proceeding jumps. When alarmed they stamp their hind feet and may utter a loud shrill squeak.

Samango monkeys *Cercopithecus mitis* are inhabitants of evergreen forests on the southern slopes of the Soutpansberg and on the escarpment in the Woodbush — Ohrigstad sector. They are diurnal and gregarious, living in troops of up to 30 individuals. Unlike vervet monkeys they are predominantly arboreal, unwilling to venture out of their evergreen forests. Samango monkeys have become a pest in some commercial timber plantations causing considerable damage to pines by ringbarking trunks and damaging the apical buds. The main threat to this species is the replacement of indigenous forest by commercial plantations for the growing timber industry.

The giant rat *Cricetomys gambianus* is a large rodent about 80 cm long from head to tail, weighing up to 2,8 kg. These crepuscular and terrestrial rats are restricted to the evergreen forests on the Soutpansberg. Omnivorous but predominantly vegetarian, giant rats are avid diggers for bulbs and tubers. This food is carried in their well-developed cheek pouches or, if too large, in their mouths, to their subterranean burrows. The cup-shaped nest which can be a metre or more below the surface is lined with vegetable debris and unpalatable remains of food, stones, bones, etc. Litters of between two and four young are born during the summer months.

The striped weasel *Poecilogale albinucha* is widely distributed in Africa south of the equator. In the Transvaal it is restricted to areas west of 30°E where it occurs in open savanna woodland and grasslands. It is a nocturnal, terrestrial and generally solitary animal. Owing to its small size, short legs and low-slung body striped weasels are infrequently observed in the wild. Consequently, they may be more common than is generally believed, and there is no evidence to suggest that their numbers or range have declined.

The African civet *Civettictis civetta* occurs throughout the north-central and eastern parts of the Transvaal in forest and savanna woodland where it is associated in particular with riverine vegetation. Nocturnal and generally solitary, civets are omnivorous animals feeding on insects, wild fruit, mice, reptiles, birds, amphibians, millipedes and spiders. Where carrion is more freely available it is preferred. Civets are assiduous markers, spraying a sweet-smelling secretion onto grass, twigs or other objects from their perinial glands. They also deposit their faeces at latrines or civetries. These are usually located adjacent to paths and roads. Litters of two to four young are born during the summer months.

Throughout their range Meller's mongoose *Rhychogale melleri* are nowhere common and in the Transvaal they occur in a restricted area in the Lowveld from Phalaborwa and the confluence of the Olifants and Klaserie Rivers to the southern parts of the KNP. They are nocturnal, terrestrial and solitary. Little is known about their habits. They live predominantly on termites, while insects, reptiles and amphibians form a small portion of their diet. There is no evidence that this mongoose has declined in either range or numbers.

Another rare nocturnal mongoose is Selous' mongoose *Paracynictis selousi.* This species occurs in a restricted area in the Northern Transvaal and on the escarpment but, because of its solitary and nocturnal habits it may have been overlooked elsewhere. It is sometimes confused with the larger white-tailed mongoose *Ichneumia albicauda* both having white tails, but the Selous' mongoose has only a small white patch at the tip of its tail. It is an avid digger after such prey as insects, spiders, scorpions, mice and reptiles. It occasionally eats birds. No decline in its numbers or range has been measured.

KOOS DE WET

Red duiker *Cephalophus natalensis* is an evergreen forest and coastal scrub species. In the Transvaal it occurs in the Soutpansberg forests along the escarpment from Mariepskop into Natal, as well as in riverine forests and thickets in the Nelspruit area. Where it does occur it appears to be fairly common, but the destruction of their habitat by agriculture, and illegal hunting, are thought to be causing a slow but steady decline in their range.

The aardwolf *Proteles cristatus* is a totally harmless carnivore which occurs throughout the Transvaal. Although this animal is taxonomically related to the hyaena it has a very different character. The aardwolf feeds exclusively on various species of termites. Although it has well-developed canines it's cheek teeth are small and peg-like so that it cannot chew meat at all. The aardwolf is threatened because a sector of the farming community mistakenly accuse aardwolf of causing stock losses. Many animals are inadvertently and sometimes deliberately killed on the roads at night because, disorientated by bright headlights, they tend to stand still.

The small spotted cat *Felis nigripes*, also called the black-footed cat and miershooptier, is confined to the southern and south-western parts of the Transvaal. Nocturnal, solitary and secretive, these beautiful cats are very seldom seen. As a result very little is known of their ecological requirements and habits, and they may even be more common than is generally believed.

Leopards *Panthera pardus* formerly occurred throughout the Republic. Today they are restricted mainly to the Transvaal savannas, northern Natal and the Cape mountains. The leopard population in the Transvaal is generally considered to be reasonably large, although no census could be taken to date. Leopards are hunted by the stock-farming community because specific individuals can cause considerable damage. Leopards are usually either shot at the site of a kill or trapped in cages baited with goats. Some experimentation is being undertaken regarding the advisability of, and successes with, the translocation of problem individuals.

The hippopotamus *Hippopotamus amphibius* was recorded in South Africa for the first time in 1825 by Desmoulins in the lower reaches of the Berg River, in the then Cape Colony. It was formerly found in large river systems and pans throughout the Republic but is now confined mainly to suitable rivers in the Eastern Transvaal Lowveld and the KNP, the Limpopo and stretches of its tributaries, and in Natal. Hippos cause considerable damage to crops in the vicinity of their daytime river refuges, and the expansion of agriculture has been the primary cause of their decline in numbers. A large population occurs in the KNP. It is estimated that the hippo population in river systems in the rest of the Province does not exceed 500 individuals.

Brown hyaenas *Hyaena brunnea* are frequently and wrongly regarded as problem animals and are shot, or they fall victim to poisoned bait. Brown Hyaenas feed exclusively on carrion and experiments have shown them to be patently incapable of killing even such small domestic stock as sheep. Unlike the spotted hyaena the brown hyaena is a quiet, solitary animal.

The serval *Felis serval* is an elegant cat with it's long legs and neck, small head, large ears and beautifully spotted and barred coat. It occurs in the central Transvaal savanna and the Lowveld, and preys nocturnally, mainly on mice, but also on birds, reptiles, insects and amphibia. Servals are wrongly considered problem animals and although their numbers do not appear to have declined in the Transvaal, they have declined elsewhere in the Republic.

The tsessebe *Damaliscus lunatus lunatus* was historically a common antelope species in the Northern Transvaal. The erection of fences and the systematic game eradication programmes during the post-war years caused the extinction of tsessebe and other antelopes over large areas of their range. Today natural populations occur on only a few farms in the Ellisras area and near Klaserie, in addition to the KNP. The Directorate's highly successful conservation programme has led to a growing population and it is estimated that there are now over 1 000 tsessebe in more than 50 localities outside the KNP. Thirty-seven percent of these animals are conserved on Provincial Nature Reserves. Additional private land is restocked annually as the population grows.

Sharpe's grysbok *Raphicerus sharpei* is found only in the northern and north-eastern parts of the Transvaal. This small relative of the more common steenbok *R. campestris* is always associated with arid rocky terrain in the northern Waterberg, Soutpansberg and Limpopo Valley. Predominantly nocturnal, grysbok live in dense vegetation. They usually occur singly or as a female with her lamb, and are shy and secretive. They browse and graze. There is no evidence to suggest that Sharpe's grysbok has declined either in numbers or range. Viable populations occur on four Provincial nature reserves.

Out of Danger

Two species, the cheetah *Acinonyx jubatus* and the African elephant *Loxodonta africana* are both now listed as out of danger. Cheetah have bred successfully in captivity and were reintroduced to a number of conservation areas. Elephants are common in the KNP and their numbers have to be controlled to prevent overpopulation. Unfortunately, the presence of elephant is incompatible with most farming activities and translocation to private land is not feasible in the long term.

Indeterminate

Forty-five species are listed in this category, 22 of which occur in the Transvaal. So little is known of all these species that their true conservation status cannot be determined; some, even, may not be threatened at all. The Transvaal species consist of three shrews, three golden moles, eleven bats and five rodents.

LORNA STANTON

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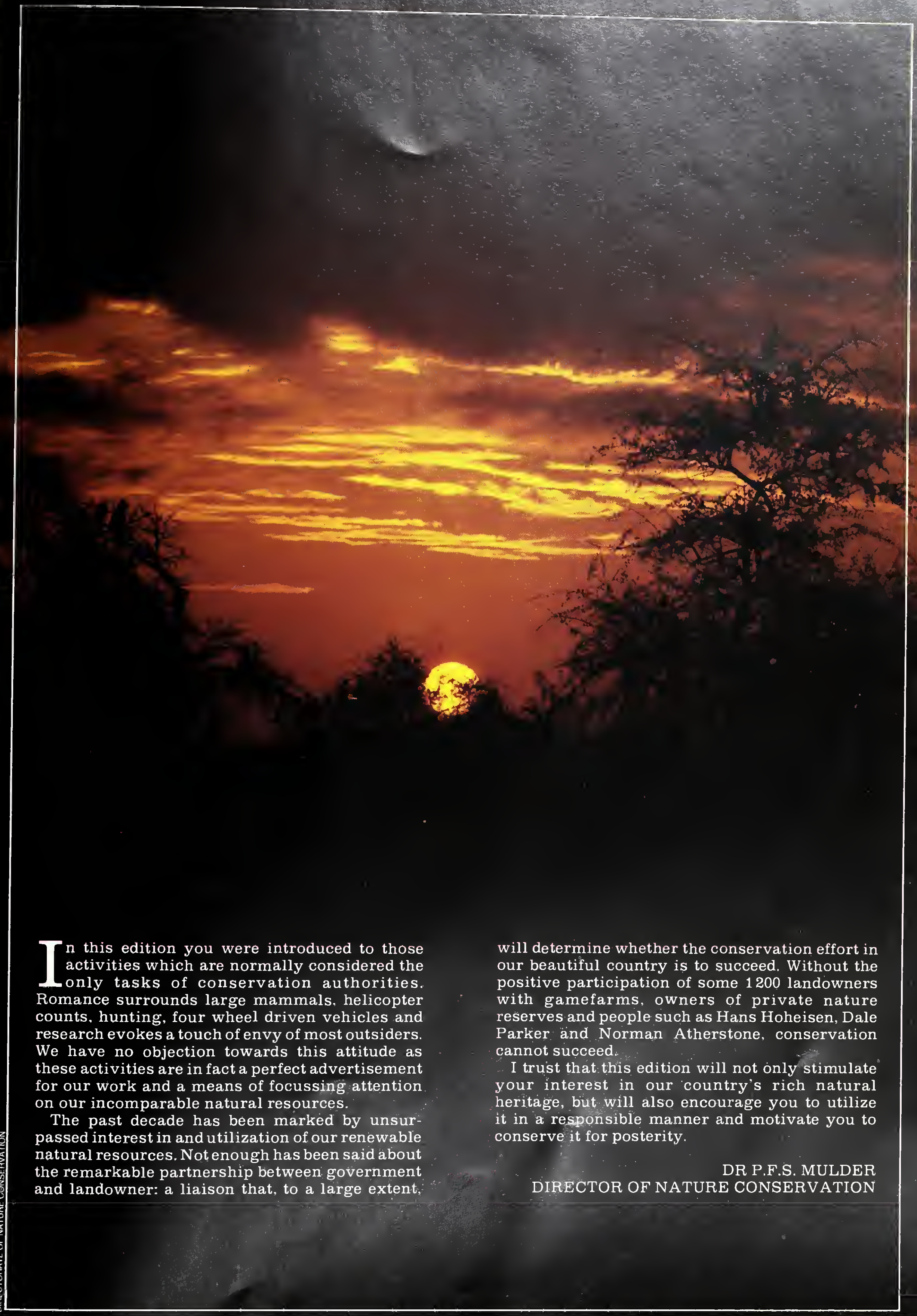

DIRECTORATE OF NATURE CONSERVATION

In this edition you were introduced to those activities which are normally considered the only tasks of conservation authorities. Romance surrounds large mammals, helicopter counts, hunting, four wheel driven vehicles and research evokes a touch of envy of most outsiders. We have no objection towards this attitude as these activities are in fact a perfect advertisement for our work and a means of focussing attention on our incomparable natural resources.

The past decade has been marked by unsurpassed interest in and utilization of our renewable natural resources. Not enough has been said about the remarkable partnership between government and landowner: a liaison that, to a large extent, will determine whether the conservation effort in our beautiful country is to succeed. Without the positive participation of some 1 200 landowners with gamefarms, owners of private nature reserves and people such as Hans Hoheisen, Dale Parker and Norman Atherstone, conservation cannot succeed.

I trust that this edition will not only stimulate your interest in our country's rich natural heritage, but will also encourage you to utilize it in a responsible manner and motivate you to conserve it for posterity.

DR P.F.S. MULDER
DIRECTOR OF NATURE CONSERVATION

DICK WOLFF

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Cover: One of the many facetts of the Soutpansberg where disturbed land stands in direct contrast with the indigenous forest in the background.

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JANET MATHEWS

The Soutpansberg is South Africa's northernmost mountai range.

Lying 50 km north of the Tropic of Capricorn, the Soutpansberg is South Africa's northernmost mountain range. It is also one of the most beautiful, visible from more than 70 km away as a low, shimmering purple line, stretched out along 130 km from east to west.

Waterpoort

JANET MATHEWS

The Soutpansberg

W R TARBOTON

It straddles the 23°S latitude line, rising abruptly from the plains in the west near the village of Vivo and gradually petering out in the east where the Venda boundary meets the Kruger National Park. Its highest peak, Letjume, at 1 747 m above sea-level, lies about 800 m above the surrounding plains.

The range derives its name from the large saltpan found at the base of its northern slope in the west — a pan which has probably been used by game since time immemorial, and whose salt has been exploited from stone-age times right up to the present. The naming of the mountain is attributed to a group of settlers under the leadership of a colourful historical figure named Coenraad de Buys who settled in a secluded valley near Mara in the 1820s and whose descendents still live there. Twenty five kilometers to the west lies another impressive mountain known as the Blouberg, towering above the surrounding bushveld to a height of 2 051 m above sea-level, a home to many interesting plants and animals, and a source of many legends and stories. It is, however, the Soutpansberg and not the Blouberg that is the subject of this issue of Fauna & Flora.

The Soutpansberg is made up of an ancient sequence of sedimentary rocks and basaltic lavas (about 1 800 - 1 900 million years old) known as the Soutpansberg Group. They have been strongly faulted and displaced along east-west trending fractures, and this has given rise to the characteristic series of ridges and troughs that make up most of the range. The most striking rocks are the weather-resistant Wyllie's Poort Quartzites which, as a result of the repeated faulting, recur as successive ridges, and they form the impressive brow of south-facing cliffs along the western part of the range. The characteristic red and purple colouration of the Soutpansberg sediments is evidence that they were subjected to oxidising conditions during their deposition, and this provides a geological marker as to when the earth's atmosphere is thought to have first contained free oxygen. Subsequent to their deposition, the Soutpansberg strata were overlain by the more recent sediments and basalts of the Karoo Group. These less resistant rocks have been stripped away by aeons of weathering and erosion. A mute reminder of the fact that the Soutpansberg was once buried under younger sediments is the superimposed drainage line of the Sand River: it flows northwards out of the plains that lie to the south of the mountains, weaves through the range via a spectacular valley, and emerges again onto the plains in the north. The river not only contributed considerably to the removal of the overlying rocks, but also carved the impressive gorge, known as Waterpoort and now used as a railway route through the Soutpansberg.

Apart from the salt occurrence mentioned earlier, minor copper mineralisation and a few relatively inaccessible occurrences of low-quality clay, nature has apparently not endowed the Soutpansberg with any economically viable mineral deposits. However, to the north and south, either in the older underlying rocks, or in the younger Karoo rocks, important deposits of coal, copper, magnesite and graphite occur, but on the mountain itself no deposits of significance are yet known.

Instead, nature has endowed this range with an often spectacular landscape and an unparalleled spectrum of vegetation types which form a gradient from east to west and from north to south that is orchestrated by the local variations found in the amount of rain falling. In the east, the towering Entabeni receives one of the highest annual rainfalls recorded in South Africa, averaging 1 860 mm, and this drops off as one proceeds westwards and crosses over from the southern slope into the rain-shadow area. Thus Hanglip, in the centre of the range receives an average of about 1 000 mm per annum and Vivo and Langjan, lying out west on the plains, only about 400 mm per annum.

The highest rainfall areas support 'mistbelt' type evergreen forests. The most extensive, covering about 1 800 ha, are those occurring on Entabeni, with the Hanglip forest, overlooking Louis Trichardt, next in size at 286 ha. As one strikes westwards the forest occurrences become smaller and more fragmented, although it is here, at Letjume and Dundee, that some of the largest of the Soutpansberg's yellowwood trees occur. These misbelt forests fall within the Acocks veld-type known as "north-eastern mountain sourveld" which is essentially a forest-grassland mosaic. While the forests have been relatively well preserved, virtually all the grassland areas have disappeared under commercial afforestation and subtropical fruit orchards. Also associated with this veld-type, one finds areas wooded with protea species and, in the rocky outcrops, with stemfruit and other rock-loving

JANET MATTHEWS

Wyllie's Poort.

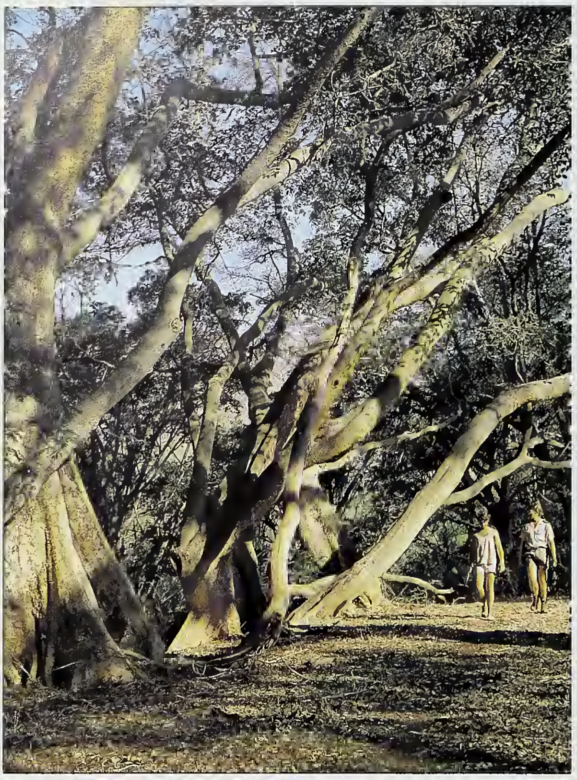
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Fig trees at Waterpoort.

plants. Semi-deciduous forests occur locally at lower altitudes, and in many of the lower-lying ravines the spectacular, giant-leaved forest fever tree is found.

As one moves into lower rainfall areas so the vegeta-

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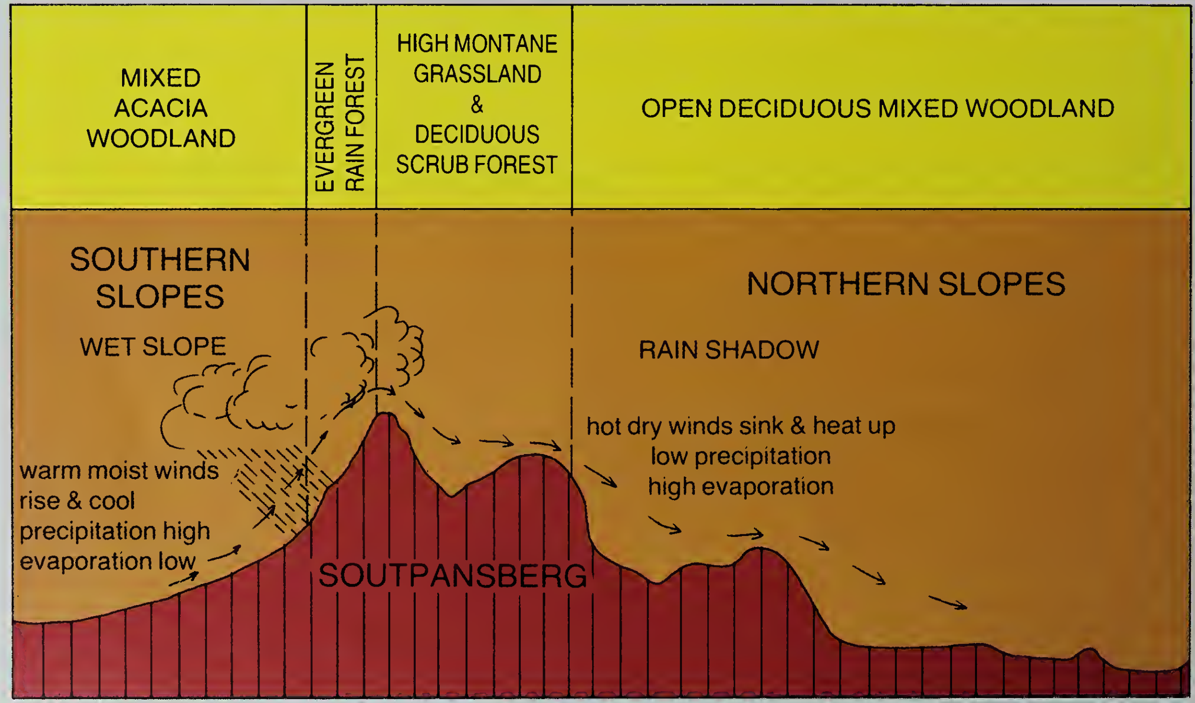
The town of Louis Trichardt now stands where the pioneer Voortrekker disembarked in 1836.

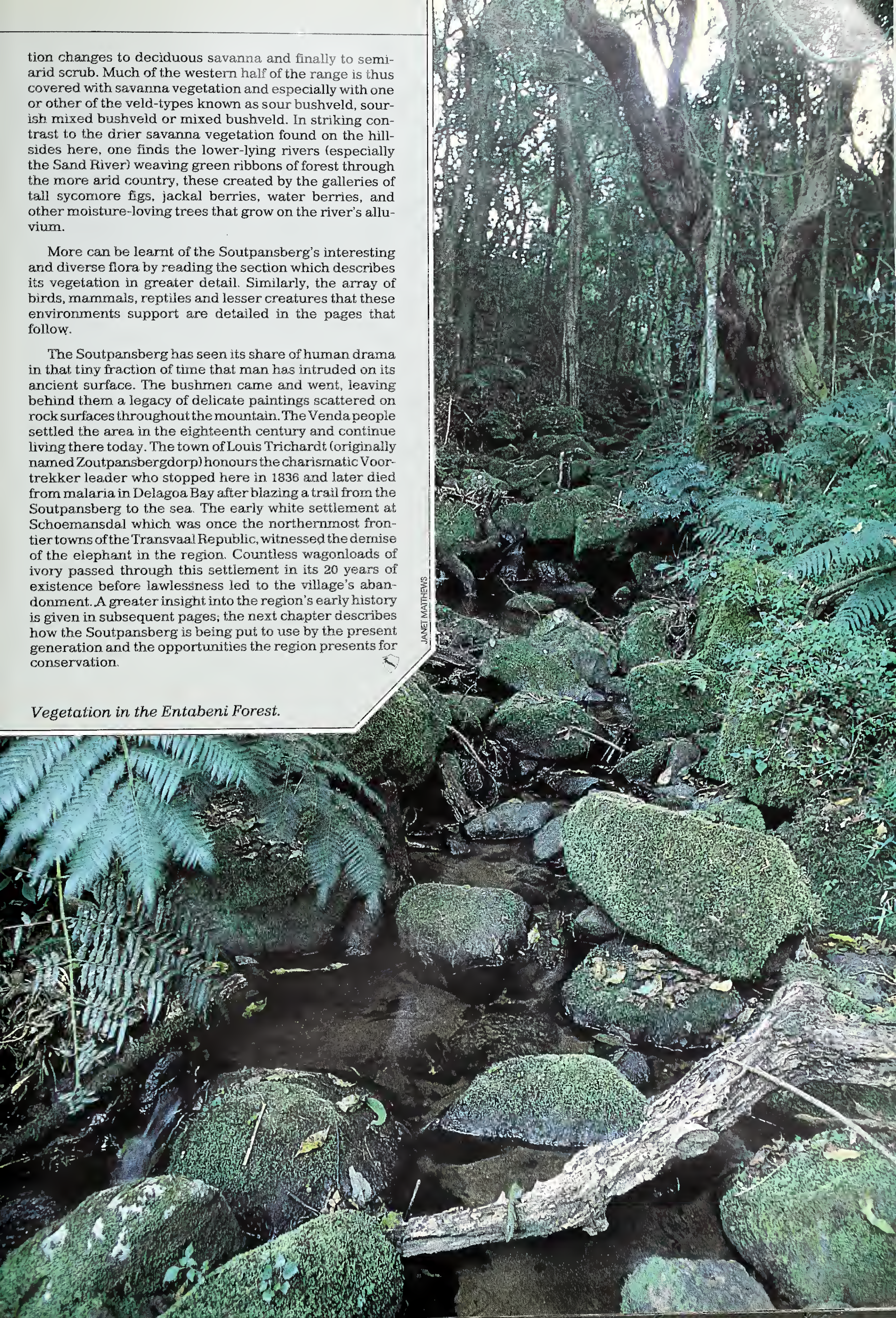

MIXED ACACIA WOODLAND
EVERGREEN RAIN FOREST
HIGH MONTANE GRASSLAND & DECIDUOUS SCRUB FOREST
OPEN DECIDUOUS MIXED WOODLAND
SOUTHERN SLOPES
WET SLOPE
warm moist winds rise & cool precipitation high evaporation low
NORTHERN SLOPES
RAIN SHADOW
hot dry winds sink & heat up low precipitation high evaporation
SOUTPANSBERG

Schematic cross-section of the Soutpansberg showing the vegetation and climate.

tion changes to deciduous savanna and finally to semi-arid scrub. Much of the western half of the range is thus covered with savanna vegetation and especially with one or other of the veld-types known as sour bushveld, sourish mixed bushveld or mixed bushveld. In striking contrast to the drier savanna vegetation found on the hillsides here, one finds the lower-lying rivers (especially the Sand River) weaving green ribbons of forest through the more arid country, these created by the galleries of tall sycomore figs, jackal berries, water berries, and other moisture-loving trees that grow on the river's alluvium.

More can be learnt of the Soutpansberg's interesting and diverse flora by reading the section which describes its vegetation in greater detail. Similarly, the array of birds, mammals, reptiles and lesser creatures that these environments support are detailed in the pages that follow.

The Soutpansberg has seen its share of human drama in that tiny fraction of time that man has intruded on its ancient surface. The bushmen came and went, leaving behind them a legacy of delicate paintings scattered on rock surfaces throughout the mountain. The Venda people settled the area in the eighteenth century and continue living there today. The town of Louis Trichardt (originally named Zoutpansbergdorp) honours the charismatic Voortrekker leader who stopped here in 1836 and later died from malaria in Delagoa Bay after blazing a trail from the Soutpansberg to the sea. The early white settlement at Schoemansdal which was once the northernmost frontier towns of the Transvaal Republic, witnessed the demise of the elephant in the region. Countless wagonloads of ivory passed through this settlement in its 20 years of existence before lawlessness led to the village's abandonment. A greater insight into the region's early history is given in subsequent pages; the next chapter describes how the Soutpansberg is being put to use by the present generation and the opportunities the region presents for conservation.



Vegetation in the Entabeni Forest.

JANET MATTHEWS

LAND USE

The Great North Road, which winds its tortuous route northwards from Louis Trichardt through the Soutpansberg towards Messina effectively divides the mountain range into two blocks differing markedly in land use.

East of the road the higher rainfall and agriculturally superior soils have led to this block being intensively used for forestry and agriculture. There are few extensive areas of pristine habitat left and large tracts of land have been afforested with commercial timber plantations. The largest of these is the 11 340 ha Entabeni State Forest (falling under the jurisdiction of the Forestry Branch of the Department of EnvironmentAffairs) in which some 5 800 ha of plantations have been established; there are many other smaller plantations belonging to private timber companies. The pines grown in this region are used mainly for structural and industrial sawtimber and for fruit and tomato boxes while the eucalypts are used for producing treated and mining poles. A number of local sawmills handle this production.

Following on timber, subtropical fruit farming is the next most important form of land use. The development of orchards of avocados, mangoes, nuts and citrus has gained tremendous impetus during the last decade, with avocados covering many high-lying fertile areas where the annual rainfall exceeds 900 mm. At lower levels where there is access to irrigation water, citrus, nut and mango farming is practised. Irrigation also provides the opportunity to grow vegetables such as tomatoes and onions on a limited scale. Coffee is also being grown here experimentally.

By contrast, the block lying west of the Great North Road, with its more limited water resources, agriculturally marginal soils, dearth of mineral deposits and poor industrial potential, has remained in a relatively pristine state. It is here that game farms, weekend retreats and unspoilt landscapes feature prominently.

The majority of properties in the western Soutpansberg are privately owned: there are currently some 177 such owners, many of whom are absentees, using their farms here as weekend or holiday retreats. Two areas here are State land: the Hanglip State Forest (of which some 900 ha is under timber and 200 - 300 ha under natural forest) and the 1 824 ha provincial nature reserve known as Happy Rest, located at the place where the first white settlement in the Soutpansberg was founded. The Schoemansdal Veld School is located in this reserve. In all about 2 000 ha are under commercial plantations in the western block and this is probably the maximum extent of afforestation in this

Pine trees are used for building construction and industrial saw wood.

JANET MATTHEWS

region on account of the limited extent of suitable timber land.

After timber, cattle ranching is probably the most economically important form of land use in the western block. There are severe constraints on this farming activity, however: steep terrain makes fencing difficult in many areas, low rainfall (in the north) and periodic droughts result in low carrying capacities for most of the region. Goats are also farmed on a limited scale and are subjected to the same constraints as cattle, with the added hazard from stock losses to leopards, which are common predators in the mountain ranges.

The wild, rugged terrain of the western Soutpansberg, where access to many higher-lying areas is restricted to four-wheel drive vehicles, lends itself to nature conservation-orientated land use and a number of the landowners here have established game farms, wilderness trails, camping areas and hunting lodges. The farm Marius at Wyllie's Poort is a private resort of this sort. Other resorts open to tourism are for example Lesheba Wilderness along the Sand River and Buzzard Mountain Retreat on the mountain's southern slope. The Department of Environment Affairs maintains two hiking trails in the Soutpansberg, one at Hanglip which takes two days to complete (with 21 or 30 km options) and a five-day trail at Entabeni which covers 91 km. These pass through numerous patches of indigenous forest as well as montane grassland, plantations and farmland. At Hanglip State Forest there is also a popular picnic site set within an extensive patch of natural forest.

The Forestry Act regulates which areas may or may not be afforested, and planting permits are allocated according to river catchment areas, with the western Soutpansberg falling partly in the Njelele and partly in the Sand River catchment. Conditional to the granting of a permit is that a 20 m minimum width must be left unplanted along rivers and other areas important for water conservation such as sponges and wetlands. The Act also prescribes fire protection measures and the burning and maintaining of fire belts. Finally, the Act provides for declaration of fire-free zones during certain times of the year, and in this respect much of the Soutpansberg is annually declared a fire-free zone from 1 August to 14 November.

A second law — the Conservation of Agricultural Resources Act — also provides for environmentally acceptable forestry and other land use practices to ensure that indigenous forests and natural water courses are not destroyed indiscriminately, that forestry roads are adequately drained and maintained, that exotic invader plants are controlled and that soil erosion is combatted. Finally the Na-

After afforestation the cultivation of subtropical fruit trees is the most important land use.

JANET MATTHEWS

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There are two hiking trails in the mountain which total over 100 km.

ture Conservation Ordinance plays an important environmental role in controlling the use of indigenous plants and animals in the area.

The salt occurrence at 'Soutpan' on the northwestern edge of the range is the only economically exploitable mineral deposit known in the Soutpansberg and salt extraction is the only mining activity currently being conducted in this region.

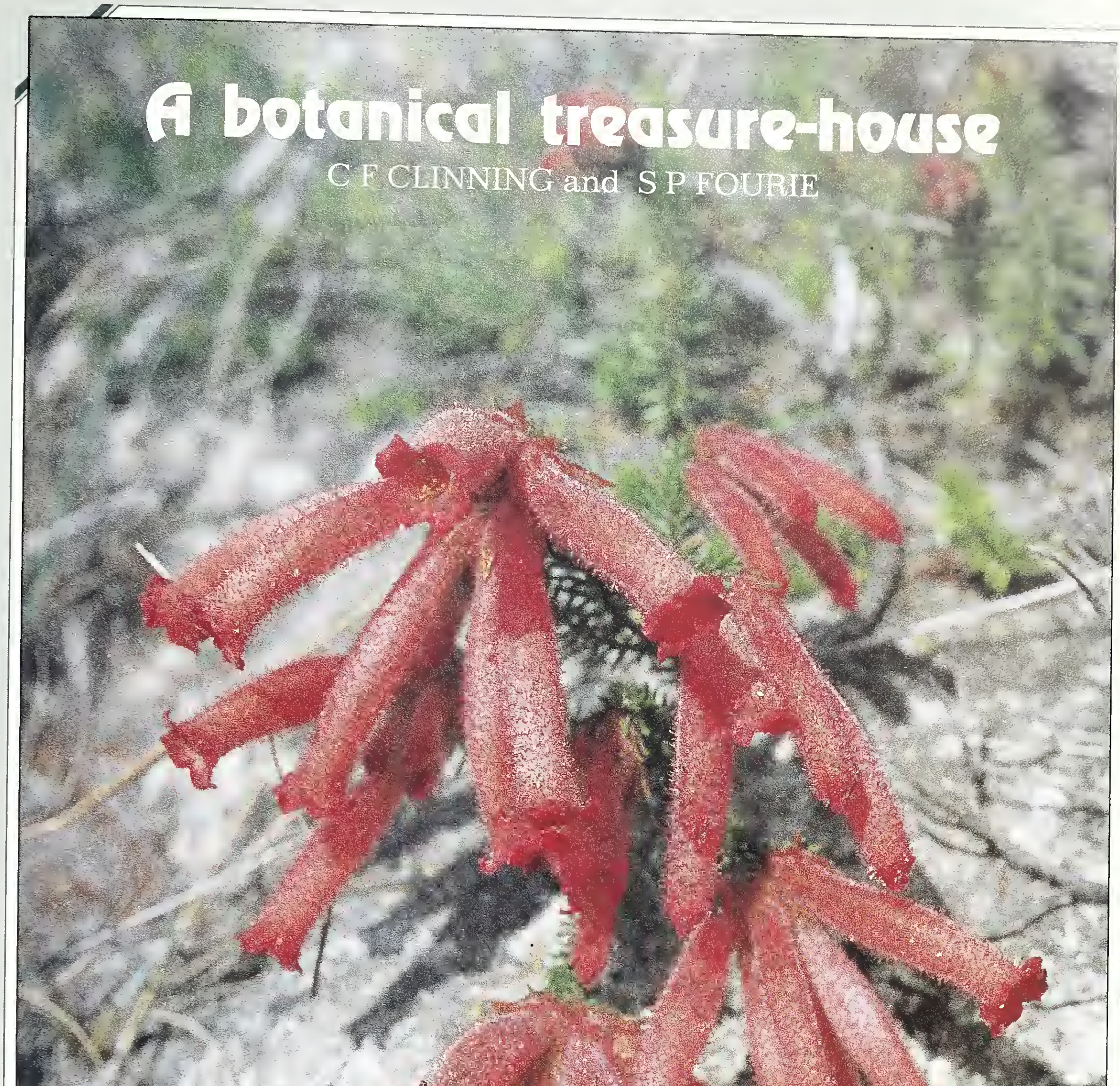
To date, seven privately owned farms which extend over nearly 14 000 ha in the western Soutpansberg have been registered as South African Natural Heritage Sites on the basis of their having rare or unusual plant communities, natural features or the habitats of threatened species. It is satisfying to know that many landowners recognise the uniqueness of their properties in the Soutpansberg and are developing these for recreational and conservation-orientated purposes in which the outstanding beauty and unspoilt nature of the area is being maintained rather than degraded or destroyed.

JANET MATTHEWS

The only mineral deposit being exploited in the Soutpansberg is the salt collected from the soutpan.

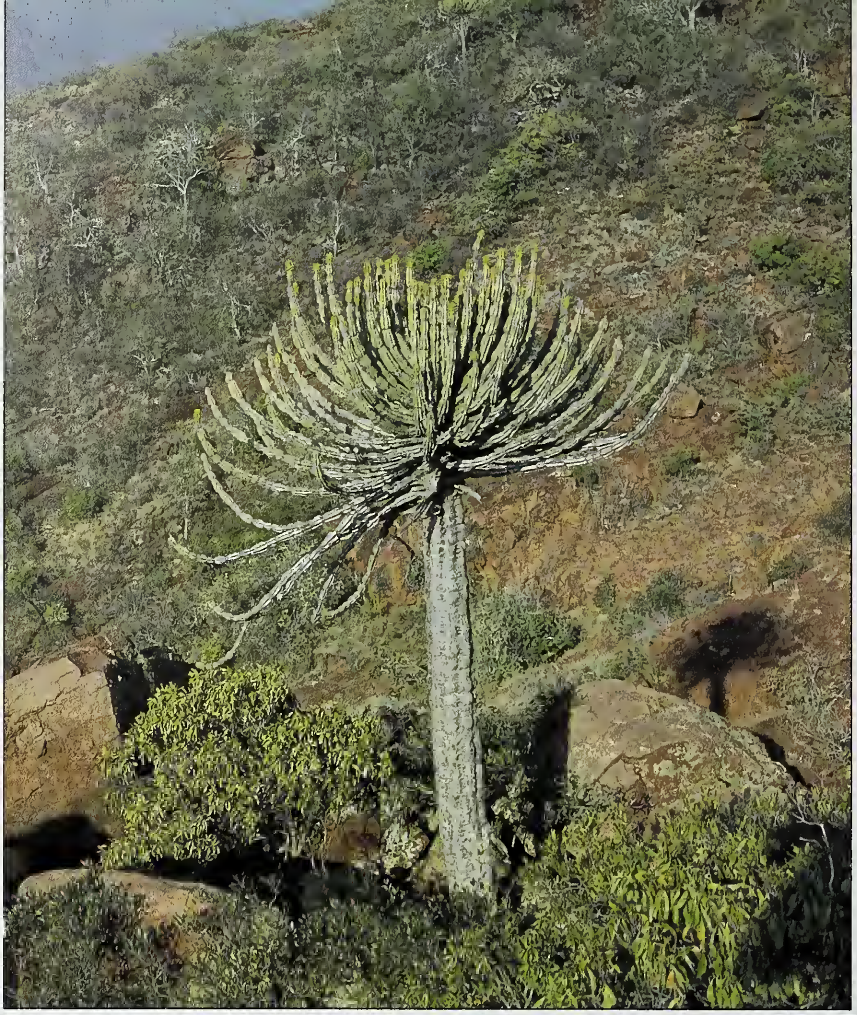
A botanical treasure-house

C F CLINNING and S P FOURIE



S. P. FOURIE

The heath, **Erica cerinthoides**, is associated with high montane grassland.



S. P. FOURIE

The gentle sloping wooded northern slopes and kloofs are characterized by the Soutpansberg euphorbia, **Euphorbia soutpansbergensis.**

Travelling through the Soutpansberg on the Great North Road, one cannot fail to notice the wide spectrum of habitats, vegetation types and plant species passed *en route*. Vegetation types from the south (the temperate macchia), from the north (the tropical forests and savannas), from the west (the Kalahari) and from the east (the coastal plains) all converge and contribute elements of their flora to the Soutpansberg. In addition, isolation within the mountain range has evolved a number of endemic plant species found nowhere else on earth.

A plant lover visiting the mountain would do well to establish his camp, with consent from the landowner, on the northern slopes, where giant baobabs *Adansonia digitata* provide numerous suitable camp sites. Legend has it that the hyaena was given the task of planting these trees and in his stupidity he put them in all upside down. The baobab is the world's largest succulent plant and during the winter months does indeed resemble a tree with its roots in the air, but in summer it develops a dense canopy of bright green leaves and bears large, white, sweetly scented flowers. Although these flowers attract a large number of insects, they are mainly pollinated by bats and to a lesser extent by other small mammals, notebly night apes. The large, hard-shelled, velvety fruits that develop following pollination contain an astringent and slightly effervescent dry pulp which is eagerly sought after by monkeys, baboons and humans, as a source of food and refreshment.

Another common tree in this area is the knob thorn *Acacia nigrescens* with thorns which develop to form egg-sized knobs on its rough bark. In the scant shade of one of the old acacias one may find the attractive *Ruspolia hypocrateriformis*, a tall, much-branched shrub with large, simple, ovate leaves and masses of bright red tubular flowers at the ends of its branches. *Ruspolia* is known to hybridize in the wild with *Ruttya ovata*, a similar looking shrub of the area. The hybrid, *Ruttyruspolia*, was first found and introduced into cultivation by Phyllis van Heerden of Louis Trichardt, in whose honour it has been named. It is a splendid addition to gardens in frost-free areas, producing masses of rose-pink flowers, and deserves to be more widely cultivated.

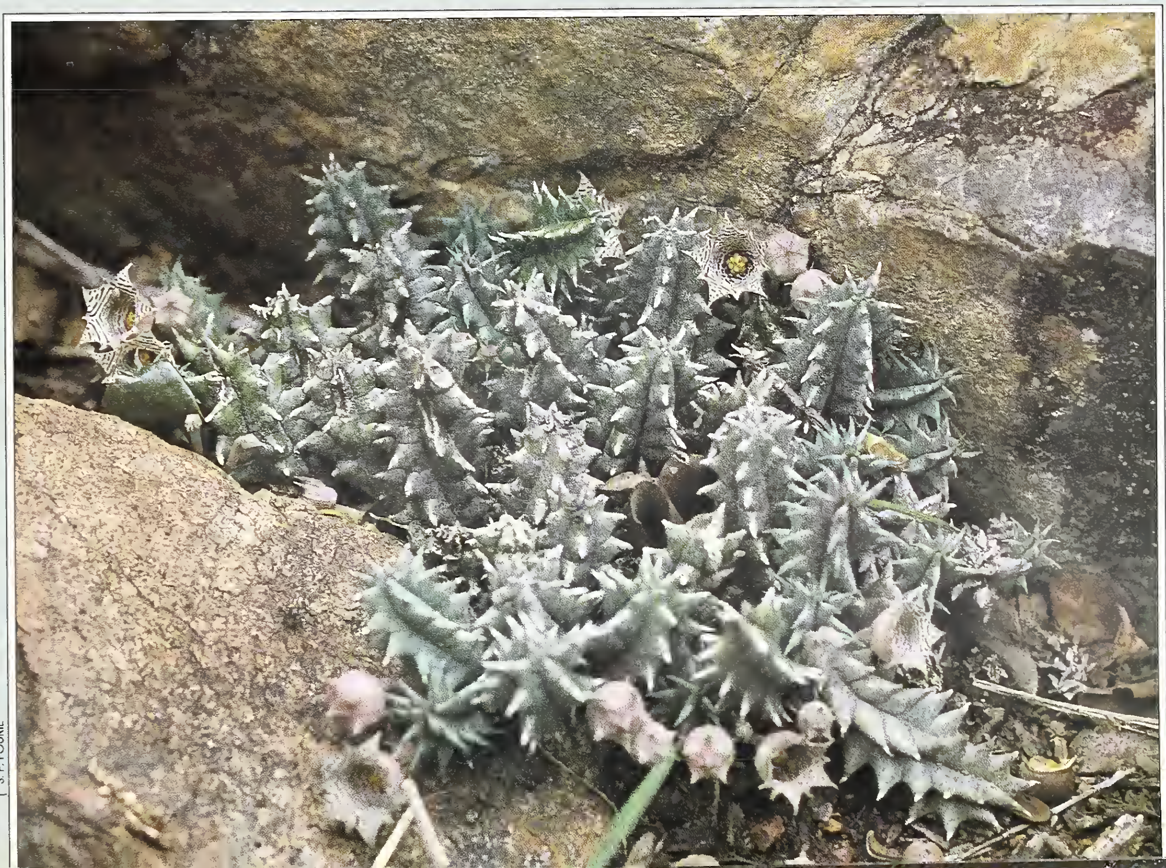
The bedrock of the gentle northern slopes of the mountain is weathered sandstone and in the many cracks and crevices grows *Huernia nouhuysii*, a dwarf stapeliad endemic to the Soutpansberg. Although its range is restricted, it may be locally common in suitable habitat where it occurs in association with *Euphorbia schinzii*. This spiny euphorbia is widespread in the Transvaal but the Soutpansberg plants are somewhat more robust than those at the southern extremity of the species' range. Another euphorbia found in the area is the Soutpansberg euphorbia *Euphorbia soutpansbergensis*, which may be seen at the northern entrance to Wyllie's Poort. It too, is endemic to the Soutpansberg and there are large populations in the many hot, dry kloofs that characterize the region. These same kloofs also have large populations of the endemic Wyllie's Poort aloe *Aloe angelica*, a tall, slender-stemmed aloe with bright red and yellow flowers that colour the otherwise drab countryside in mid-winter.

The Lebombo ironwood *Androstachys johnsonii* is characteristic of the summits of these northern slopes, where it may occur in dense, uniform stands. From a distance these thickets are easily recognized as their dark, matt-green foliage contrasts with the otherwise dry surroundings. The poison rope *Strophanthus luteolus* is one of the plants that may be encountered within these thickets. Its cream-coloured flowers have long, twisted, drooping petals and occur in profusion during the flowering season. The fruits of this species are as attractive as its flowers, they resemble a long, tapering spindle, comprised of two long capsules set opposite each other. Within the *Androstachys* thickets grows one of the Soutpansberg's rarest endemic plants; during a survey of the rare plants of the mountain only 67 individuals of *Stapelia clavicorona* were found but from this wild population botanists of the Directorate of Nature and Environmental Conservation have established more than 900 plants to be returned to suitable habitat in the Soutpansberg.

Moving westward, away from the ironwood thickets, the soil becomes more sandy and the vegetation on the plateau changes accordingly. Here the dominant trees are the magnificent red syringa *Burkea africana*, their rounded canopies emerging well above the silvery, grey-green thickets of the silver cluster-leaf *Terminalia sericea* and the rounded, feathery-leaved weeping wattle *Peltophorum africanum* with which they grow. *Peltophorum* makes a fine show when in bloom, with clusters of bright yellow flowers set among its somewhat drab, olive-green leaves. Other trees common in this area are the kudu berry *Pseudolachnostylis maprouneifolia* with its spectacular fiery autumn and winter foliage, and the paperbark commiphora *Commiphora marlothii* with its peeling, papery bark that flaps audibly in the wind.

The northern woodlands, away from the summit, are characterised by a number of species of trees: the shepherd's tree *Boscia albitrunca*, knobthorn *Acacia nigrescens*, marula *Sclerocarya caffra*, weeping wattle *Schotia brachypetala* and leadwood *Combretum imberbe* are all common. Cross the mountain however, a completely different group of species will be encountered: ebony *Diospyros mespiliformes*, wild pear *Dombeya rotundifolia*, rain tree *Lonchocarpus capassa* and large-fruited combretum *Combretum zeyheri* characterize these slopes.

The mist-shrouded summits, particularly to the west, support an open montane grassland, with some species having affinities to the Cape fynbos. Here one finds the heath *Erica cerinthoides* and two everlastings *Helichrysum kraussii* and *H. splendidum*, as well as the daisy *Felicia fruticosa*, and among lichen-covered boulders thickets of stunted real yellow-woods *Podocarpus latifolius* and mountain cypress *Widdringtonia nodiflora*, all festooned with strands of old man's beard. In among



Huernia nouhuysii *is restricted in its distribution to the Soutpansberg.*

S. P. FOURIE

the grass the delicate, pink-orange flowers of *Tritonia nelsonii* make a splash of muted colour and Vogts' aloe *Aloe vogtsii* boldly displays its scarlet inflorescence. The clumps of lichen-covered boulders give way to patches of scrub-forest, with species such as mountain snake bush *Enterospermum rhodesiacum*, rock elder *Canthium mundianum*, Transvaal milkplum *Bequaertiodendron magaliesmontanum*, Cape beech *Rapanea melanophloeos*, wild jasmine *Schrebera alata*, blue bitterberry *Strychnos usambarensis*, Transvaal wild banana *Strelitzia caudata*, false olive *Buddleja saligna*, assegai *Curtisia dentata* and waterberry *Syzygium cordatum* growing in profuse tangles. On the fringes of these forests, patches sagewood *Buddleja salvifolia* grows thickly and its profusion of pale pink or purple flowers fill the air with its sweet scent, attracting a myriad of hovering, buzzing insects. In early spring the massed bright, white flowers of common wild pear *Dombeya rotundifolia* contrast with the scarlet inflorescences of the common coral tree *Erythrina lysistemon* where the two grow side by side.

To the east, below Hanglip, a prominent landmark in the area, evergreen high forests clothe the southern slopes. The wild quince *Cryptocarya liebertiana*, red stinkwood *Prunus africanus*, Cape chestnut *Calodendron capense*, lemonwood *Xymalos monospora*, Congo ironwood *Cassipourea congoensis* and forest elder *Nuxia floribunda*, are among the most impressive species of these forests, remnants of which survive in sheltered kloofs as far west as Letjume, the highest point of the Soutpansberg and almost at its western extremity. These forests and some of their elements are rare and deserve a high conservation status.

The rare, endemic *Kalanchoe crundallii*, a small fleshy herb of the family *Crassulaceae*, grows and produces its bright scarlet flowers in sunny patches on the forest floor. Where mountain streams cascade over moss-clad boulders, a group of tall common tree ferns *Cyathea dregei* spread their fronds above a mat of wolf's paw *Lycopodium verticillatum*, the difference in size and growth form between the two giving no indication of the fact that both fall into the division *Pteridophyta*, the spore bearing plants. There are many other ferns and fern allies in these wet, shady areas, amongst them the lithophyte *Oleandra distenta* which grows profusely in the misty spray of small waterfalls. This fern derives its name from the resemblance of its simple fronds to the leaves of the oleander tree *Nerium oleander*, in contrast to some of the *Adiantum* and *Asplenium* ferns with their finely divided fronds, that are so common on rocks and trees in the forest understratum.

Most of these forests have lost their giant timber trees to past generations of foresters and woodcutters. Large specimens of the Outeniqua yellowwood *Podocarpus falcatus* are now rare in sheltered ravines around Letjume and the Sand River gorge. The largest of these has a height of 39 meters and a diameter at breast height of 1,69 meters. Although they are related to the pines and are highly resiniferous, yellow woods bear fruits that are much sought after by samango monkeys and by some of the fruit-eating forest birds. The upper parts of the Hanglip forests contain some fine specimens of the bastard stinkwood *Ocotea kenyensis*. These differ from the stinkwood *Ocotea bullata* in that they lack the conspicuous blisters or bullae on the upper surface of the leaves, from which the epithet *bullata* derives. They also lack the distinctive but offensive smell of the stinkwood.

S. P. FOURIE

The ghostlike cream coloured flowers of the climber **Strophanthus luteolus**, *enhances the mystery of the Lebombo ironwood forests.*

The Modjadji cycad, **Encephalartos transvenosus**, *occurs sporadically along the Soutpansberg and elsewhere in the Transvaal.*

D. D. MARUIS

Where the forests give way to the immense south-facing cliffs of the eastern Soutpansberg, Modjadji cycads *Encephalartos transvenosus* with their large yellow cones seem to defy gravity as they cling to the sheer cliff faces by means of relatively poorly developed root systems. They are not restricted to the cliffs however, and to the west large populations of these cycads can be seen in gently sloping areas near Happy Rest and some are found in the montane grasslands of the mountain tops. A plant that is restricted to the cliffs or large rocky outcrops, where it grows wedged in fissures on the southern aspects, is the beautiful grass aloe *Aloe soutpansbergensis*. As the name implies, this is another endemic which flowers in summer producing eight large orange-coloured flowers in a single inflorescence that contrast brightly with the rosette of slender, light-green leaves.

To the west, where the climate is drier and forests less well developed, the talus slopes of the mountain impediment are covered in dense *Acacia*. The common hook thorn *Acacia caffra*, sweet thorn *Acacia karoo* and umbrella thorn *Acacia tortillis*, are the dominant species with sickle bush *Dichrostachys cinerea* and buffalo thorn *Ziziphus mucronata* interspersed among them and almost pure stands of *Catha edulis*, which resemble small eucalyptus trees, in places. Known as Bushman's tea, *Catha edulis* has long been known to have narcotic properties and was used by the early trekkers and settlers as a cure for influenza. Like most narcotic plants, prolonged use has deleterious side effects and often results in the death of the user. On these dry slopes succulents are also common, and mountain aloe *Aloe marlothii* and common tree euphorbia *Euphorbia ingens*, both of which flower in winter, add colour to an otherwise dull winter landscape.

In the Sand River gorge and other dry ravines in the Soutpansberg the large mountain mahogany *Entandophragma caudatum* is common. These trees have large woody capsules that split open when ripe into five sections that curve back from the tip to resemble a peeled banana, no wonder the tree is sometimes called the wooden banana. The Sand River gorge, Wyllie's Poort and other sheltered kloofs in the mountain range provide suitable habitat for plants which are not common elsewhere in the Soutpansberg. It is in these ravines that the succulent stemmed porkbush *Portulacaria afra* grows, its abundant sprays of tiny, star-shaped, pink or mauve flowers are offset by the dark-green fleshy leaves. A very rare member of the family *Asclepiadaceae*, *Orbeanthus conjunctus*, which is endemic to the Soutpansberg, also grows here. Its long, scrambling, succulent stems form a dense interwoven network with conspicuous cream-coloured flowers with contrasting crimson annulli borne singly or in pairs. The closely related *Orbeanthus hardyi*, occurs in the area but it enjoys a much wider distribution.

The straggling shrub *Metarungia longistrobus* also flourishes in the dense undergrowth of these wooded kloofs. Once thought to be rare, this plant is now known to be widespread and locally common. Its yellow to dark-orange, bilobate flowers, in dense inflorescences on short axillary branches make it a worthy garden subject and it should be brought into cultivation in South African gardens.

The remarkably diverse flora of the Soutpansberg has much to offer both botanist and horticulturalist. It needs to be carefully conserved so that future generations may also enjoy it and it is our duty to prevent the plundering of this treasure house.

Metarungia longistrobus *is a component of the understorey vegetation in wooded kloofs.*

The beautiful composite **Felicia fruticosa**, *colours the high-lying areas with a mauve patchwork.*

S. P. FOURIE

Lesser known mammals

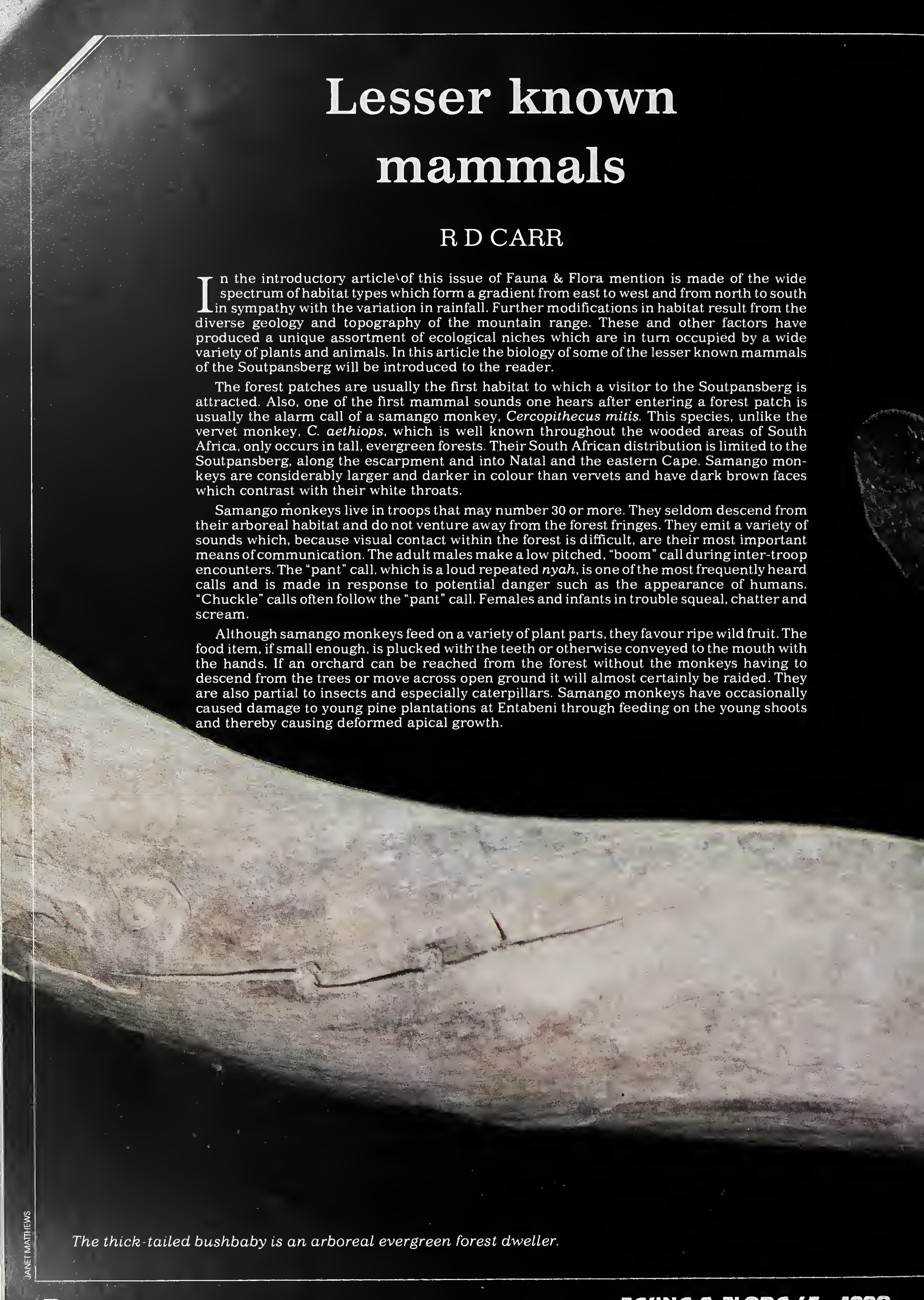
R D CARR

In the introductory article of this issue of Fauna & Flora mention is made of the wide spectrum of habitat types which form a gradient from east to west and from north to south in sympathy with the variation in rainfall. Further modifications in habitat result from the diverse geology and topography of the mountain range. These and other factors have produced a unique assortment of ecological niches which are in turn occupied by a wide variety of plants and animals. In this article the biology of some of the lesser known mammals of the Soutpansberg will be introduced to the reader.

The forest patches are usually the first habitat to which a visitor to the Soutpansberg is attracted. Also, one of the first mammal sounds one hears after entering a forest patch is usually the alarm call of a samango monkey, *Cercopithecus mitis*. This species, unlike the vervet monkey, *C. aethiops*, which is well known throughout the wooded areas of South Africa, only occurs in tall, evergreen forests. Their South African distribution is limited to the Soutpansberg, along the escarpment and into Natal and the eastern Cape. Samango monkeys are considerably larger and darker in colour than vervets and have dark brown faces which contrast with their white throats.

Samango monkeys live in troops that may number 30 or more. They seldom descend from their arboreal habitat and do not venture away from the forest fringes. They emit a variety of sounds which, because visual contact within the forest is difficult, are their most important means of communication. The adult males make a low pitched, "boom" call during inter-troop encounters. The "pant" call, which is a loud repeated *nyah*, is one of the most frequently heard calls and is made in response to potential danger such as the appearance of humans. "Chuckle" calls often follow the "pant" call. Females and infants in trouble squeal, chatter and scream.

Although samango monkeys feed on a variety of plant parts, they favour ripe wild fruit. The food item, if small enough, is plucked with the teeth or otherwise conveyed to the mouth with the hands. If an orchard can be reached from the forest without the monkeys having to descend from the trees or move across open ground it will almost certainly be raided. They are also partial to insects and especially caterpillars. Samango monkeys have occasionally caused damage to young pine plantations at Entabeni through feeding on the young shoots and thereby causing deformed apical growth.



The thick-tailed bushbaby is an arboreal evergreen forest dweller.

JANET MATHEWS

Another forest dweller which is not frequently encountered is the giant rat, *Cricetomys gambianus*. This species occurs widely throughout tropical Africa, but in South Africa it has so far only been found on the Soutpansberg and near Tzaneen. These large rodents, as the colloquial name implies, are up to 80 cm long and weigh over 1 kg. They can be recognised by their large size and by the colour of the tail, the end half of which is white and is not scaled. The body is grey coloured, darker along the mid-back, the flanks are pale grey, and the underparts are white. The animals also have distinct black or dark brown patches around the eyes and at the base of the whiskers.

On the Soutpansberg, giant rats are found in the higher rainfall areas where there is adequate cover in the form of dense vegetation. They are predominantly nocturnal although some crepuscular activity has been recorded. They occasionally climb into trees and bushes in search of fruit, but usually feed at ground level. They dig their own burrows which consist of a vertical entrance shaft leading to a system of galleries with side branches and chambers about 1,5 m below the surface. Separate chambers are used for food storage, for sleeping, for latrines, and as nurseries which the females line with leaves and other debris. At the entrances to the burrows are piles of recently excavated soil which, characteristically, are in the form of consolidated pellets so shaped because the giant rat uses its teeth rather than its feet for digging. Their burrow systems have two or more entrances which are probably escape routes as they are not frequently used. In Nigeria the local people refer to a person who is constantly on the move as "making a monthly flit like the giant rat".

The thick-tailed bushbaby, *Otolemur crassicaudatus*, is an arboreal evergreen forest dweller which goes about its business only after dark. These small primates have an overall length of about 75 cm, with the tail longer than the length of the head and body and weigh up to 1,5 kg. They are pale grey in colour, tinged with buffy or brown. Their fur is long, fine and soft.

Their resting places are usually high up in the forest canopy amongst thick vegetation such as tangled creepers and tree foliage. They rest during the day in family groups of up to six individuals but, while foraging at night they are generally solitary. Each family has a number of resting places within its home range which can be as large as seven hectares.

Thick-tailed bushbabies communicate with each other in two distinct ways. Olfactory communication is mainly accomplished through urine washing. This is done by raising the hand and foot on one side simultaneously and passing them under the genital region where the hand is urinated on. The foot is then repeatedly grasped in the hand and the

The red duiker is a shy animal very rarely seen.

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The giant rat is up to 80 cm long and weighs over one kilogram.

whole action is duplicated for the other side. In this way the animal transfers personal scents or pheromones, contained in the urine, to the substrate. Both sexes also have chest glands which are larger and more conspicuous in the males than in the females. They rub these glands on branches and also mark each other by chest rubbing. Although normally silent, thick-tailed bushbabies can be very noisy, uttering very loud, harsh wailing sounds which can be heard over long distances. Calls from one individual are sometimes answered by others and this could be connected with territorial behaviour and aid the dispersed individuals of a particular group to keep in contact.

Thick-tailed bushbabies feed mainly on fruit and the gum which exudes from various trees. They also eat insects, bird's eggs and occasionally reptiles and birds.

Unquestionably the most amazing adaptation in the animal kingdom is the power of flight. The true flying mammals are the bats. World-wide, bats fall into two major catagories, *viz* insectivores and fruit eaters. The smaller insectivorous bats are a common sight in the night sky throughout South Africa but fruit bats are more restricted and generally a novelty to urban dwellers. The Soutpansberg is home to a number of fruit bat species, one of which is Peter's epauletted fruit bat, *Epomophus crypturus*. These are quite large animals measuring about 15 cm from head to tail with a wingspan of almost 40 cm and weighing up to 140 g. Females are somewhat smaller than the males and weigh a little less. Their body colour is very variable, usually being brownish-buff on the upper parts, but sometimes nearly white. The underparts are paler. Both sexes have white patches at the base of the funnel-shaped ears but only the males have the "epaulettes" on the shoulders.

These epaulettes are sunken glandular pouches in the skin covered with long white hair. When under stress, when vocalizing or possibly under sexual stimulus, these pouches are everted and the white hair, which in this species is 9 mm long, forms conspicuous white rosettes and hence the colloquial name. The three epauletted fruit bat species which occur in southern Africa all have similar epaulettes.

Peter's epauletted fruit bat occurs throughout Zambia, Malawi, Zimbabwe and extends southwards through the Lowveld into Natal. Their distribution is governed by the availability of fruit-bearing trees and on the Soutpansberg they frequent mainly the evergreen forests in the higher rainfall zone.

They are gregarious, occurring in colonies numbering up to dozens of individuals. During the day they hang inverted from thin branches of evergreen trees which offer a dense surrounding cover of foliage. While perched, each individual is spaced slightly apart from his neighbour. The colonies are very noisy, with the males vocalizing with a repeated musical bark which is uttered predominantly when hanging, but also occasionally when on the wing. As they settle in the roost after a night's foraging, there is much bickering amongst the members of the colony. They use the clawed first

LORNA STANTON

Pangolins are predominantly nocturnal and solitary.

digit and their wings to slash at other members who try to hang up too close and it takes considerable time for the colony to settle quietly for the day.

They feed almost exclusively on wild fruits which have soft and pulpy flesh. When the opportunity presents itself they raid orchards and devour fruits such as guavas, apricots, peaches, loquats and pawpaws. Firm fruits such as apples and pears remain untouched. While feeding on small fruit, they hover outside the forest canopy by wing flapping, pluck the fruit from the tree with their teeth and fly with it to a nearby feeding site. Here they hang inverted by their hind feet, clasp the fruit with the aid of the claws on the first and second digits and chew the fruit's flesh. Only the fruit juice is swallowed and the desiccated flesh is dropped below the feeding site. The feeding site is usually situated near the food tree and consists of an exposed branch on which it is easy to hang. They are wasteful feeders and the ground under their feeding sites is usually littered with the skins, flesh and pips of the fruit.

Such littering below the feeding site leads to a chain reaction whereby other animals such as duikers, civets and rodents, which could not otherwise utilize these fruits that are usually situated tens of metres above the ground, eat the fruit and in turn disperse the large seeds far from the parent tree.

A single young is produced at birth in spring. The young are born with the eyes closed, with a sparse coat of hair on the back and naked underparts. During the early stages of their lives the young fix firmly to their mother's nipples, clinging to her with their clawed digits on the forearms and the claws on their feet. The nursing mother carries her infant in flight while she is foraging. Later as they grow and become too large to be carried conveniently, she leaves the young bat hanging in the roost while she flies out to feed.

As light creeps back to the forest in the morning one may be lucky enough to catch sight of the shy red duiker, *Cephalophus natalensis,* feeding on the forest fringe or in a sunlit clearing. Red duikers are inhabitants of moist forests and coastal scrub, and occur from the southern Sudan southwards along the eastern coastal plain and escarpment to as far south as Natal. The Soutpansberg population is geographically quite isolated from the next nearest population in the Blyde River canyon area. On the Soutpansberg they range from Venda westwards along the south facing slopes, found wherever suitable patches of evergreen forest and moist scrub exist. These small antelope weigh about 14 kg and stand approximately 43 cm high at the shoulder. Both sexes have the same reddish-ochre colouration and carry a pair of short, straight horns of less than 10 cm partially obscured by a crest of darker bushy hair. In front and below the eyes, there is a bare glandular patch about 20 mm long on which opens a series of elongated pores which exude a clear sticky fluid with a faint aromatic odour. This fluid is applied to twigs at strategic sites within the duiker's territory and acts as a form of olfactory communication between individuals.

Red duikers are usually solitary or found in loosely associated pairs. They are shy and secretive and when disturbed they dart into thick vegetation. The density of their preferred thicket habitat makes them difficult to observe, but in the early morning and late afternoon they frequently venture out into clearings and fire breaks to feed on pioneer vegetation. They are mainly browsers, feeding on fallen fruit, leaves and fine stems of low growing shrubs. They have also been seen eating dry leaves from the forest floor.

After emerging from a forest patch into an area of drier scrub one may encounter another small, reddish coloured antelope, the Sharpe's grysbok, *Raphicerus sharpei.* Although resembling the red duiker in appearance, it is closely allied to the ubiquitous steenbok, *R. campestris.* This is another tropical species which extends southwards into the

Northern and Eastern Transvaal from Tanzania, Zaire, Zambia and eastwards to the coast. Although almost as tall as the red duiker, 45 - 50 cm at the shoulder, it weighs only about 7,5 kg. It is therefore much lighter in build than the red duiker. The body colour is a rich reddish-brown with the shoulders and flanks being liberally sprinkled with white hair. This white flecking is not always easy to see especially if the animal is in dappled shade.

On the Soutpansberg the Sharpe's grysbok occurs in the drier northern parts of the mountain such as in the vicinity of the Hendrik Verwoerd tunnels and Van Coller's pass. It is frequently associated with the arid Lebombo ironwood, *Androstachys johnsonii*, forests which grow on rocky terrain. Very little is known of the habits of this little antelope. It is generally considered to be nocturnal, but the majority of the author's observations have been made during the day. The animals are difficult to observe undisturbed because of the density of their habitat and their shy nature. When disturbed they dart into thick cover with a characteristic low, crouching run. Very often all that is seen is a flash of red out of the corner of one's eye.

Sharpe's grysbok are predominantly browsers but also eat grass, especially during the rainy season. Browse consists of fruit, seeds, leaves and soft stems of woody vegetation. They have also been seen feeding on the opened fruit of monkey orange, *Strychnos* spp, discarded by either kudus or baboons. It would appear that females give birth at any time of the year to a single lamb, after a seven month gestation period.

The top of the Soutpansberg is characterized by a number of rocky ridges interspaced with areas of tall *Burkea* savanna on sandy soils. These savanna areas become progressively drier towards the west. One species which can occasionally be found here is the pangolin, *Manis temminckii*. It is immediately recognizable by its armour-like covering of large, horny scales. Pangolins grow quite large, having an overall length of a little over a metre and weighing up to about 15 kg. They walk bipedally on their hind legs using the large heavy tail to balance the weight of their body and the small fore legs. There are five digits on the front feet, the central three bearing long, strongly-curved claws measuring up to 45 mm over the curve which are used for digging.

Pangolins are predominantly nocturnal and solitary. They are slow movers and when disturbed they tend to either freeze in the erect position, or if further threatened, they roll up into a ball. If left unmolested for a few minutes in complete silence, they slowly begin to unroll and if they feel safe will continue with their previous activity. Pangolins very quickly accept the presence of humans in such situations if one remains quiet. Because of their apparent tameness, their slow flight speed, their total lack of defence against human predators and the fact that their body parts are sought after as *muti* items, it is not surprising that the pangolin is a severely threatened species in Southern Africa.

Ants provide the pangolin's main food. Subterranean ant nests are located by smell and then opened by means of their sharp claws. The long pointed head is then inserted into the hole and the ants are extracted by means of a long sticky tongue which is thrust repeatedly into the nest's internal tunnels. The pangolin has no teeth, so the food is ground up in muscular regions of the stomach. While feeding, considerable quantities of soil and debris are also ingested and this roughage may well assist in the process of grinding up the food.

Very little is known of the pangolin's breeding. It would appear that single infants are born during the cold, drier months of the year. When threatened the juvenile takes refuge under its mother's body and she protects it by curling up around it. As it grows older and becomes too large to be completely enclosed, only its head and shoulders are enveloped. Juveniles are also carried on her back

Rock elephant-shrews are closely confined to a rocky habitat.

JANET MATTHEWS

with the fore claws clamped under the scales on the female's flanks and its tail clasped tightly across her back.

The numerous rocky outcrops and scree slopes, so characteristic of the Soutpansberg, are home to two species of dassie. These are small mammals which have, in the course of evolution, changed very little during the past 30 million years. One of the fossil dassie forms found at Makapansgat in the Northern Transvaal was about three times larger than the modern dassies, but otherwise similar. Two of the four dassie species occurring in South Africa are found on the Soutpansberg. The yellow-spotted dassie, *Heterohyrax brucei*, occurs from the Red Sea mountain chain in Egypt southwards down the eastern half of the continent to as far south as the Soutpansberg. The better known rock dassie, *Procavia capensis*, can be found throughout the Republic and Namibia and its distribution extends from the Cape to Zimbabwe. The yellow-spotted dassie can be distinguished from the rock dassie in the field by its distinct white or off-white patches above the eyes and by the lighter colour of the sides of the face. Although the rock dassie has pale patches above the eyes these are never white and are generally inconspicuous. It gets its colloquial name from the colour of the hair on the dorsal gland which is yellow while the rock dassie's is black. It is also slightly smaller than the rock dassie, weighing about 3 kg.

An elephant's adventure

The African elephant, *Loxodonta africana*, was once a ubiquitous inhabitant of the African continent. Regrettably, the largest of all living land mammals, it is now relegated to a fraction of its former range. The Soutpansberg lost its elephants a long time ago.

In 1980, three elephant bulls from Botswana's Tuli population crossed into the Transvaal near Pontdrift. There they made themselves very unpopular with the landowners through damaging irrigation pipes, reservoirs and farm buildings. The dissatisfied farmers, in their attempts to drive the elephants back into Botswana, split the group up and one individual decided to head southwards towards the Soutpansberg.

In spite of their large size elephants can travel remarkably fast and secretively when they decide to. Although he was never seen, his course could be followed by his spoor, the trail of damaged fences and by the signs of occasional feeding.

Within a couple of days he arrived at the northern entrance to Wyllie's Poort where his progress was halted by a three metre high weir. According to his tracks the elephant retraced his steps out of the poort and began climbing the mountain on the farm Marius, where he spent some time supposedly seeking an alternative route across the Soutpansberg range.

Then, as suddenly as he arrived he departed, following almost the same route back to the Botswana border. The question arises as to why did an elephant, which almost certainly had never been that far into the Transvaal before, travel in almost a straight line from Alldays to Wyllie's Poort, seemingly as if he knew where to cross the Soutpansberg *en route* to the next nearest elephant population in the Kruger National Park. It is said that elephants never forget.

The two species occupy similar habitat and are sometimes found side by side, although generally the yellow-spotted dassie is more frequently found on the larger mountain ranges and is rare on isolated rocky koppies. They are always closely associated with rock outcrops, cliffs, boulders or scree slopes which present essential cover in the form of holes and crevices. Dassies are the main source of food of the Black Eagle, *Aquila verreauxi*, which attacks from around corners with incredible speed. The further dassies move away from their cover to feed the more vulnerable to predation they become. They are predominantly browsers, feeding off leaves, shoots and fruit of a variety of trees and shrubs, but during the summer grass is also consumed. Dassies are accomplished climbers and can frequently be observed high up in the tree canopy feeding or basking in the sun. When disturbed, they will jump or drop to the ground from considerable heights uttering their distinctive alarm calls as they race for cover.

Dassies have specialized kidneys enabling them to exist on a diet which has a considerably lower water content than that of most other mammals. In the rocky habitats which they inhabit surface water is scarce or even nonexistent during the dry winters and they obtain all their water from plant juices and by licking up dew, and their efficient kidneys allow them to exist on a minimal water intake. Dassies urinate and defecate in what are termed "latrines". These are communal aggregations of dung and urine, also referred to as middens, which can become quite large over an extended period of time and acquire a characteristic odour.

Southern African dassies have distinct calls, a characteristic which has been used to support the recognition of the three genera. Yellow-spotted dassies have a short, shrill call which is uttered repeatedly for up to five minutes. It would appear that only the males produce these calls. During the dead of night these loud, shrill screams have an eery note which has made many an unenlightened camper momentarily fear the presence of demons.

There is an interesting group of exclusively insectivorous small mammals, characterized by the elephant-shrews. One species which is frequently observed by hikers, especially while sitting quietly at a camp site enjoying a sundowner, is the rock elephant-shrew, *Elephantulus myurus*. It is grey coloured with a soft woolly coat, about 26 cm in length and weighs about 60 g. All elephant-shrews get their colloquial name from their characteristic elongated, trunk-like snout which is exceedingly mobile, being constantly in motion, twisting up and down and from side to side as the animal tests the air. The broad, upstanding ears are as mobile as the snout and are very expressive of the animal's mood. The animal's hind legs are considerably larger than the fore legs with long slender feet.

Rock elephant-shrews are closely confined to a rocky habitat which has sufficient holes and crannies to provide safe shelter. They also have a preference for rocky habitats which have overhanging ledges or vegetation providing cover from aerial predators. When crossing open ground between boulders they do so at lightning speed. They are predominantly diurnal, but are often observed at twilight sunning themselves. Characteristically, they tend to keep to the shady cover of overhanging rocks or bushes during the heat of the day and can be difficult to observe because their grey colouration blends with the background. It is usually their twitching nose or ears which reveals their presence.

From cover they sally forth with quick hops to seize their prey, which they then carry back to the shade to consume at leisure. They are extremely agile and leap between boulders up to a metre apart. If disturbed they dive for cover, but after a few minutes they may return if the observer remains quite still. They vocalize in a series of high-pitched squeaks, tailing off at the end of the sequence to a barely audible note. In doing so the head is held high, the trunk curled back over the top of the muzzle, and the mouth held wide open. When alarmed they make a loud "purring" noise by vibrating their hind feet against the ground.

Their food consists mainly of small insects with a high proportion consisting of ants and termites. These are frequently foraged for in dassie middens. Rock elephant-shrews are also partial to various processed meats which hikers carry such as salami, bully-beef and small bits of biscuit or bread covered with a meat extract. If tempted out of their cover with these titbits and the observer remains absolutely still, they come quite close and may even use one's boot as a stepping stone.

The two young are born during the warm, wet summer months from September to March after a gestation period of eight weeks. At birth they are precocial, being born fully haired with eyes open and able to walk within a few hours. The longevity of rock elephant-shrews is some 13 months, very rarely up to 19 months. During their short lives the females may have two or three litters.

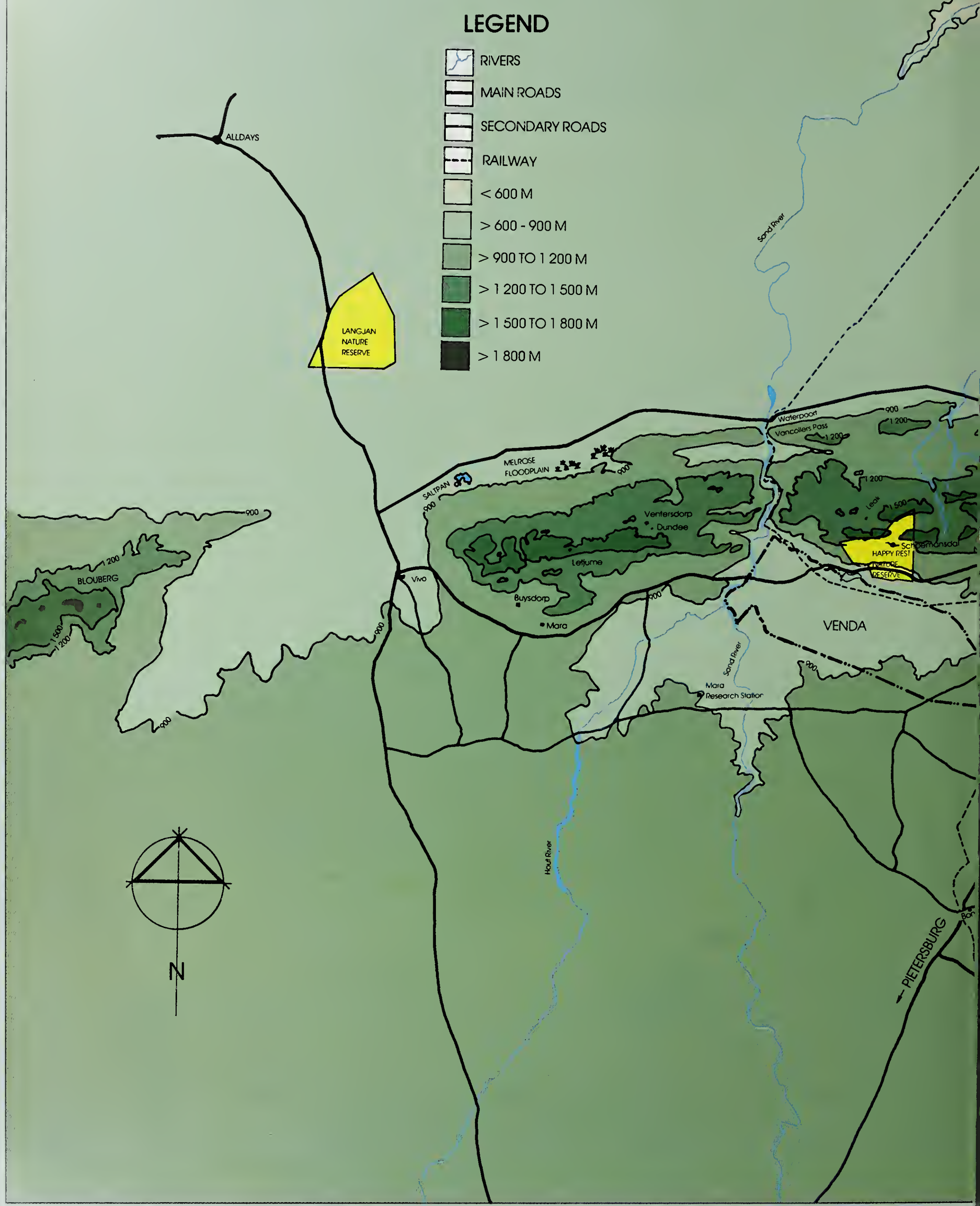
What of the future of these Soutpansberg mammals? Their continued presence here will be determined, to a large extent, by the attitude of the most dominant mammalian inhabitant — Man. The most serious potential threat to many of these mammals is habitat degradation. Even seemingly trivial modifications such as the construction of access roads and the collection of rural building materials and fire wood can be enough to initiate the degradation process. The degree of vulnerability of each species depends on their sensitivity to environmental changes and it is usually a combination of disturbances, each seemingly insignificant, which can tip the scales against a species or population. Any reduction in the rich mammalian species diversity of the Soutpansberg would be a tragedy.

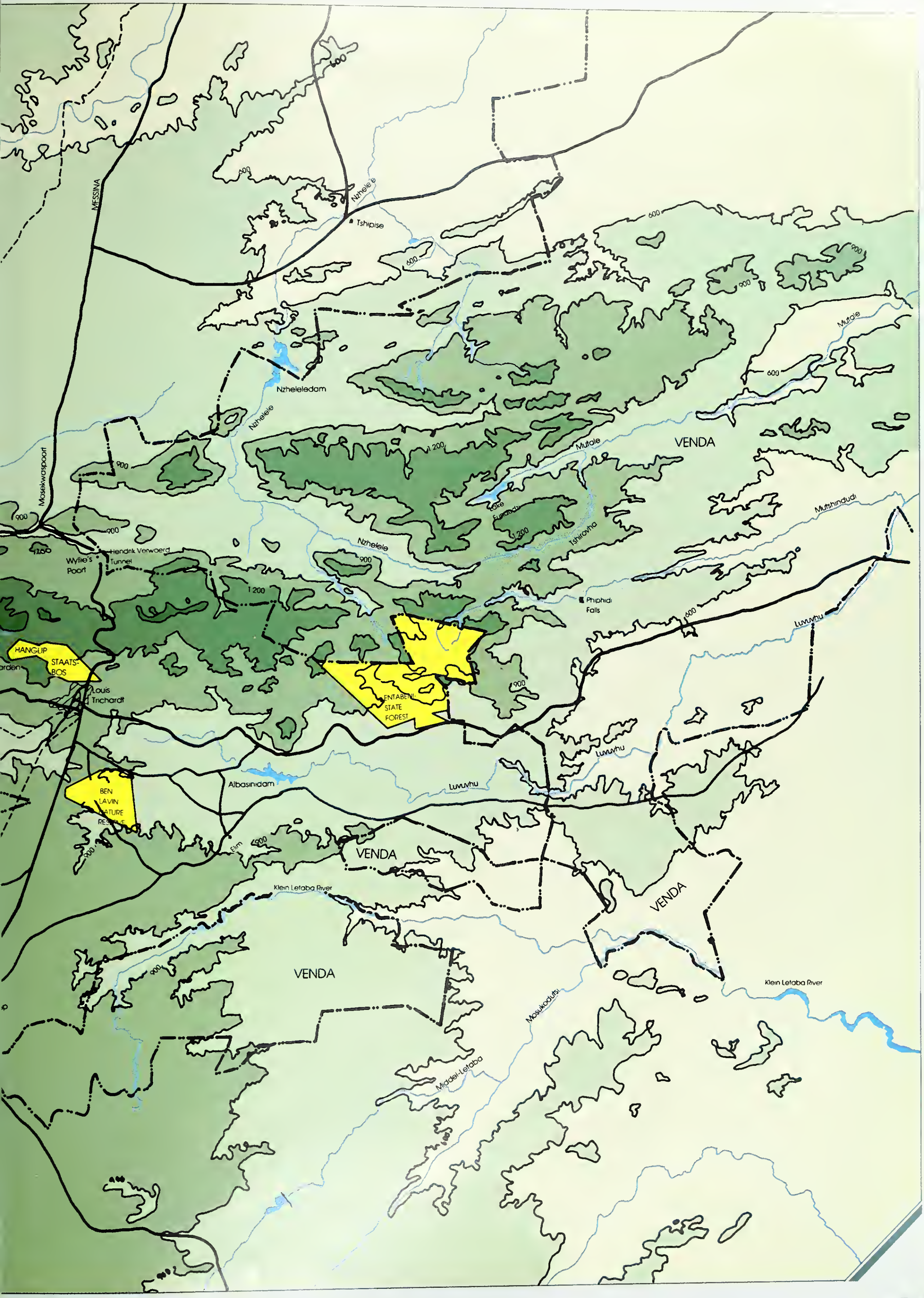
Dassies have, in the course of evolution, changed very little over the past 30 million years.

R. NEWBERY

Map of the Soutpansberg

(not drawn to scale)

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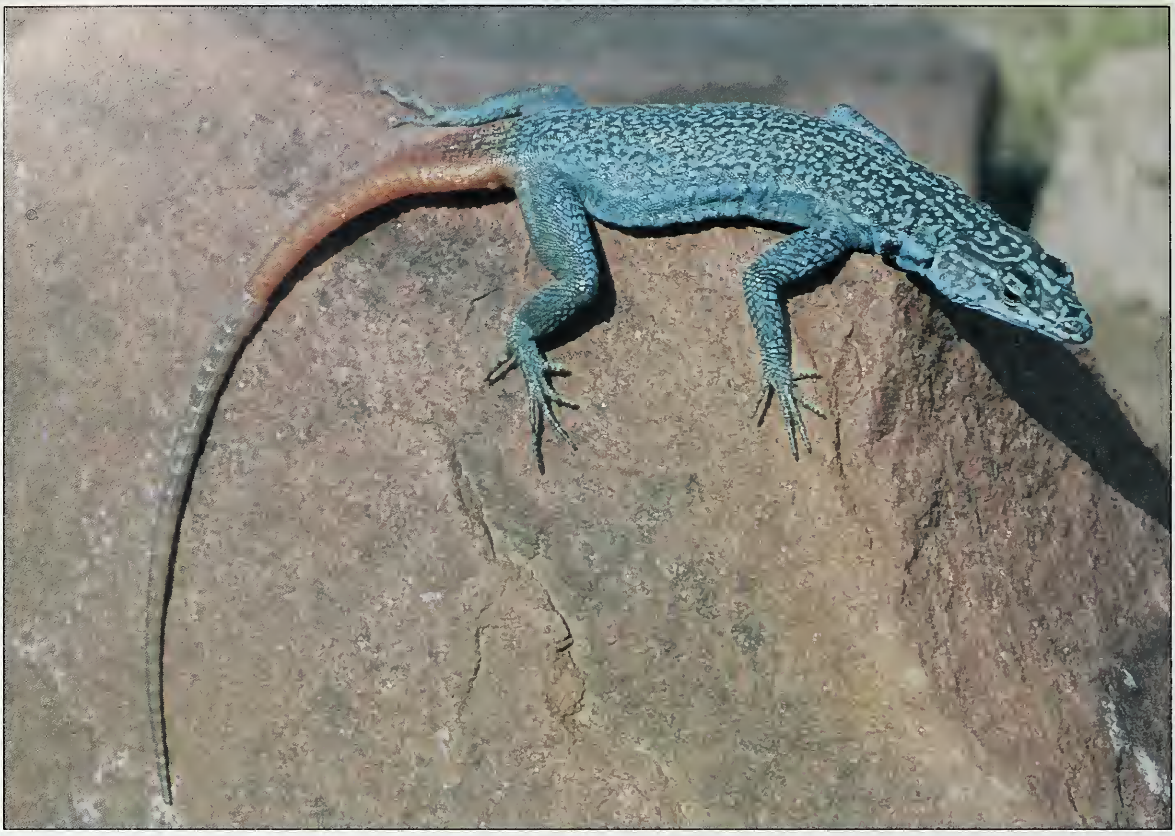

N. JACOBSEN

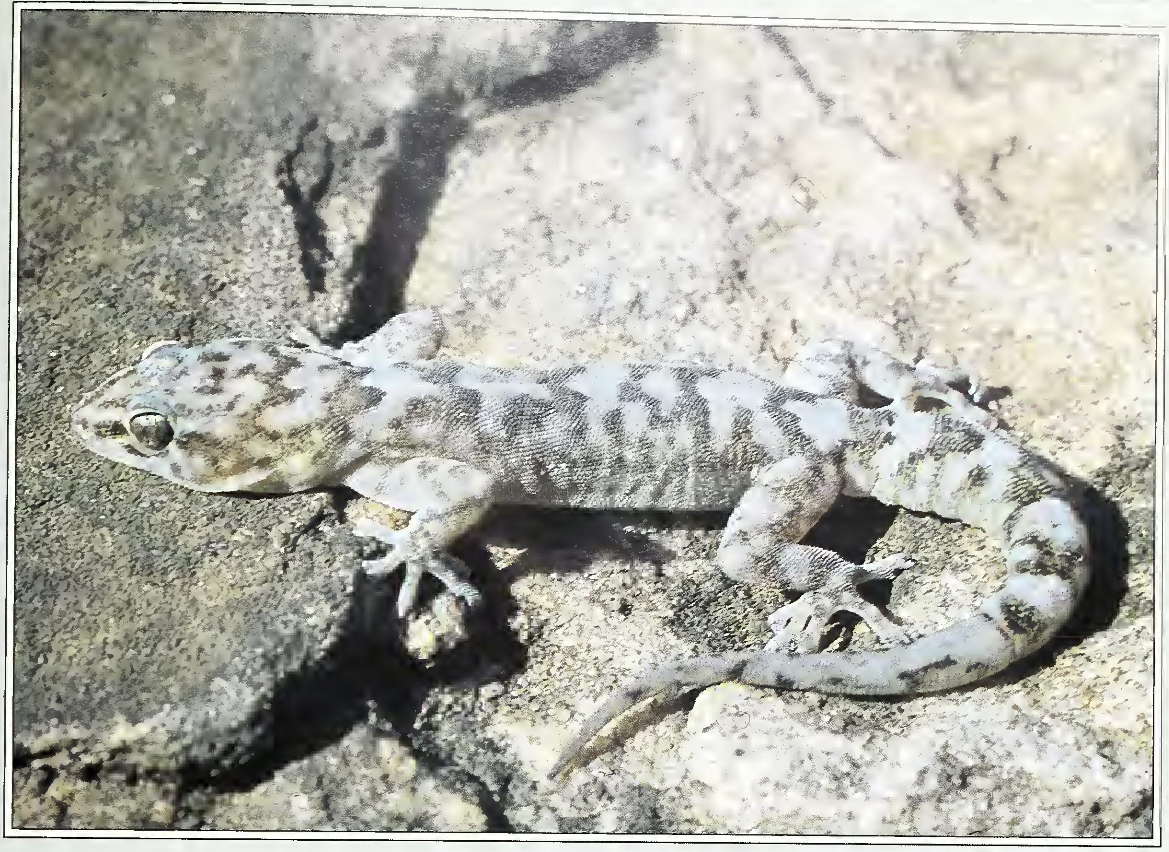
The endemic Soutpansberg flat lizard is restricted to areas of bedrock on north-facing slopes.

The Herpetofauna and other creatures

N H G JACOBSEN

The Soutpansberg, mysterious and brooding, stretches in a series of parallel ranges from east to west across the Northern Transvaal. These ranges of mountains and valleys exhibit a wide climatic variation from cool and moist in the south-east to hot and dry in the north-west. Large areas of the mountain are rocky with exposed sheets of bedrock and, primarily along the southern range, numerous cliffs and outcrops of weathered sandstone. These rocky areas are interspersed with areas of lush vegetation and even forest, which diminish as one travels westwards and northwards. Along the northern ranges the vegetation is more xeric with pronounced differences on north and south facing slopes. The crests of the mountains in the east are dominated by almost pure stands of the Lebombo ironwood *Androstachys johnsonii.*

The Soutpansberg therefore offers a diversity of habitats and climatic conditions unequalled almost anywhere else in South Africa. This has resulted in great species richness, particularly among the herpetofauna, with no fewer than 13 species and sub-species being endemic to the area. How many endemic invertebrates there are is anybody's guess as little is known of these smaller forms of life. There is at least one butterfly endemic to the Soutpansberg while others reach the northern and western-most limits of their distribution along these mountains, where climate and vegetation are suitable. There is probably a lower degree of endemism among these insects as they are mobile, flying about, and may be carried long distances by strong winds


N. JACOBSEN

This flat gecko is undescribed and endemic to the Soutpansberg living amongst rocky outcrops along the southern ranges.

to establish populations in other suitable areas. By contrast lizards, in particular, are unable to cross large tracts of unsuitable country and are more habitat bound.

The Soutpansberg is rich in species of both fauna and flora. There are a total of 43 lizards, 48 snakes, 4 tortoises and terrapins, 1 crocodile and 23 amphibians known to occur along the mountain range. Some of these represent as yet undescribed forms. Species of four biogeographical regions come together in the Soutpansberg. Temperate species include the brown egg-eater *Dasypeltis inornata*, the ocellated gecko *Lygodactylus ocellatus*, a dwarf chameleon *Bradypodion* sp., the Soutpansberg lizard *Lacerta rupicola* and the escarpment form of the Transvaal girdled lizard *Cordylus vittifer*. Tropical species include many with a wide distribution in the Transvaal like the blue-tailed koppie skink *Mabuya quinquetaeniata*, three flat lizards including the Soutpansberg flat lizard *Platysaurus relictus* and various plated lizards *Gerrhosaurus* spp. Among the Kalahari species are Richard's limbless skink *Typhlcsaurus lineatus richardi*, Leonhard's wedge-snouted worm lizard *Monopeltis leonhardi* and the horned adder *Bitis caudalis*. Elements of the coastal fauna include Lang's white-lipped snake *Amblyodipsas m. microphthalma* and its western subspecies *A.m. nigra*, FitzSimons' blind limbless skink *Typhlosaurus aurantiacus fitzsimonsi* and the black-lined skink *Mabuya homalocephala depressa*.

These distributions have their origin in past climatological events, including periods of high rainfall interspersed with long periods of great aridity. During dry periods windblown sands of the Kalahari extended eastwards to meet the sands of the coastal plain. This permitted Kalahari species to move eastwards and coastal species westwards. During wet periods increased river flow cut gaps, such as the Limpopo trough, through the escarpment, the reduced elevations forming favourable passages for some species to expand their ranges during ensuing more arid periods. At the same time erosion of the sands or of the escarpment left some populations isolated for long enough to develop characteristics of their own, giving rise to subspecies or even species.

As so much of the Soutpansberg is rocky, it is in this habitat that many reptiles are encountered. Among the most interesting of the rupicolous lizards are the flat geckos, adapted to living in very narrow crevices. Females lay two eggs at a time, which they glue to the underside of a rock. They nest communally and twenty or more eggs may be found under a particularly favourable rock slab. On the same outcrops the Soutpansberg lizard may be seen, wandering apparently nonchalantly about. A nonchalance that belies its speed for if you try to catch one, it will disappear with a swiftness one would not have thought possible.

On the warmer north-facing slopes the beautiful Soutpansberg flat lizard, the males green or blue with red tails, will entertain you. The females and immatures are more sombre, grey-black with cream dorsal stripes. While the males spend long periods basking and showing off their colours in defence of their territories the females appear to forage more actively. The females of the blue-tailed koppie skink, which are also black with white stripes are found in the same habitat but are easily recognised by their blue tails which are brighter in the juveniles than the adults. The males of this species have orange tailes and a grey to olive-brown body speckled with white. The iridescent sheen which they have immediately after shedding their skins has also given them the name rainbow skink. They also lay their eggs under rock slabs and may nest communally with up to 70 eggs being found under a suitable rock.

Snakes are also common here. In a crevice or under a rock, sheltering from the fierceness of the sun, one may find the spotted bush snake *Philothamnus semivariegatus*. Bright green to blue-green with black spots and cross-bars anteriorly, becoming bronze posteriorly, its blue, black-tipped tongue rapidly flickers in and out in an attempt to determine the cause of the disturbance, as it holds itself ready for a quick getaway. The bush snake has keeled ventral scales that enable it to climb the trunks of fairly smooth, branchless trees. It is totally harmless to man, feeding on frogs and lizards in pursuit of which it may project itself across open spaces between bushes and trees or even dive after its prey from a height of up to two meters.

As you ascend a sun-filled ravine you may glimpse an olive-grey body lying curled near some rocks. At your approach it uncoils, raises its elongated head and flickers its tongue. A black mamba! It opens its black-lined mouth and may spread a narrow hood in protest before sliding soundlessly into the rockpile. One is left with a sense of breathless awe at having encountered such a magnificent creature in its natural habitat. The yellow-bellied sandsnake *Psammophis subtaeniatus* is the most frequently encountered snake, usually no more than a streak as it dashes off among the rocks and bush. They are able to climb into bushes where, if you approach slowly and carefully, you may get a good view of their bright yellow belly, bordered by black stripes. They are among the fastest of our snakes feeding on lizards and mice and are completely harmless to man.

Under stones on the drier slopes one may find a small pink creature resembling an earthworm. But look closely, this is in fact a reptile, the Msimbiti worm lizard *Chirindia langi*. It seems amazing that so delicate an animal could survive here. Termites, their main food, are however abundant in the region and by adopting a burrowing lifestyle, these little lizards escape the harsh, desiccating rays of the sun.

Horned adders are characteristic of the sandy flats.

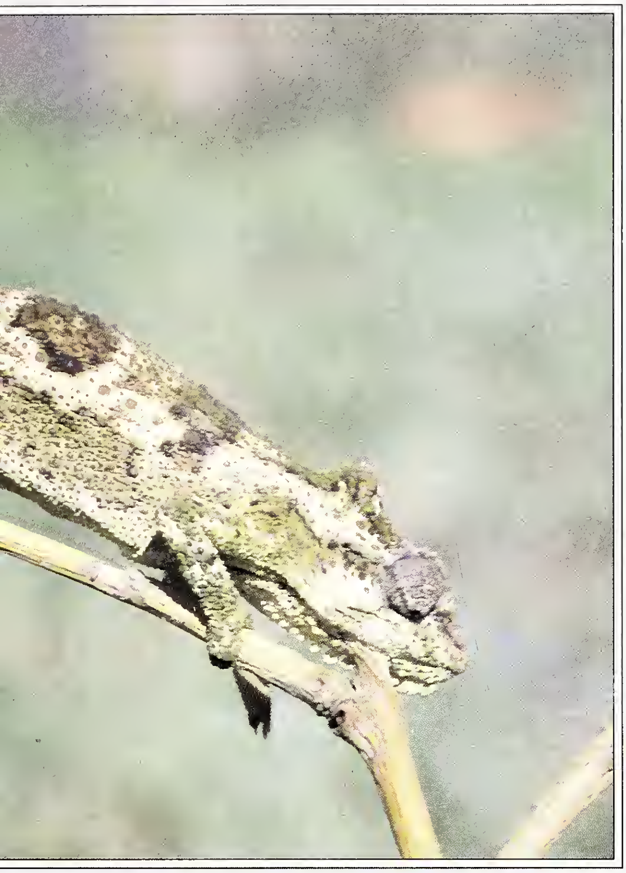
N. JACOBSEN

N. JACOBSEN

This dwarf chameleon may be

In the valleys, sandy soil derived from weathered sandstone is cut by dry watercourses following the lines of least resistance. The air here is dry, with the scent of sun-cured leaves toasting in the fiery heat of the sun. Everything is quiet as living things take shelter and time stands still. Only the continuous humming of minute, stingless mopane bees *Trigona* sp.as they search for moisture round one's eyes, nostrils and ears, breaks the silence. Then a sudden movement at the edge of a shrub catches one's eye. It is a black and yellow sand lizard *Heliobolus lugubris* dashing from shelter to shelter. It may flatten on its belly while it lifts its forefeet and waves them about, almost as if the sand were too hot for comfort, and indeed this may be thermoregulatory behaviour. The juveniles of this species are pitch black with bright yellow or cream stripes and spots. As they move about, they arch their backs, a gesture that has been interpreted by some scientists as mimicry of the predatory carabid beetle *Anthia* sp. which defends itself by spraying highly irritant formic acid into the eyes of potential predators. Such mimicry would obviously be beneficial to the young lizards if predators were fooled into avoiding them.

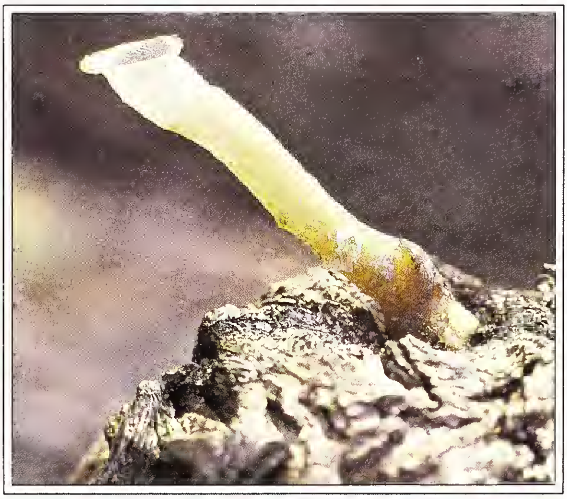
A curious spoor may be seen in the sand. It looks like a progression of wavy parallel lines. This is the track of a horned adder and if you examine it carefully, you can determine in which direction the snake has passed for it pushes up little heaps of sand behind it. Marvels of adaptation, these snakes bury themselves in the sand by flexing alternate sides of the body until they are entirely submerged. Only the nostrils, eyes and spiny horn-like scales above them are exposed. In this position the snake escapes some of the fierce rays of the sun, while being hidden from predators and prey alike. It may raise its tail tip and wriggle it slightly, luring an unwary, hungry lizard close enough to be despatched with a lightening quick strike. The venom quickly takes effect and the prey is swallowed whole.



stricted to the Soutpansberg.

A nearby log shelters a large black scorpion with a tail as thick as your little finger. This is *Parabuthus transvaalicus* sheltering by day it will move out after nightfall to hunt actively. Suitably sized insects are held in its relatively weak pincers while the powerful venom, injected from the tail-tip sting, takes it's action. If disturbed, this scorpion may squirt venom at its attacker with dire results if it enters the eyes. Further down the dry stream bed a hollow against the bank allows a little moisture to accumulate. Hundreds of butterflies gather here, mostly yellows, orange tips and purple tips, but also pansies and tiny blues, all in a dancing kaleidoscope of colours. They seek the moisture upon which all life depends.

High over the southern range clouds are gathering. Here water is abundant, with streams from seeps trickling over the rocks and through forest patches. This is the home of the Soutpansberg dwarf chameleon *Bradypodion* sp. As yet undescribed, it is closely related to the Transvaal dwarf chameleon *Bradypodion transvaalensis* from the Woodbush, a hundred kilometers to the south. In the forest a large, pale greenish-white mother-of-pearl butterfly *Protogoniomorpha parhassus aethiops* drifts gracefully among the trees while the black wings with contrasting blue windows of a forest king Charaxes *Charaxes xiphares* catch the eye before it disappears in swift, level flight among the profusion of plants. At the edge of the forest floor a leaf moves, showing a glimpse of white. Approach closer and the leaf unfolds into a beautiful red-brown and white pearl emperor butterfly *Stonehamia varanes* which flits off to a bare branch where it settles, folds its wings and becomes invisible again.



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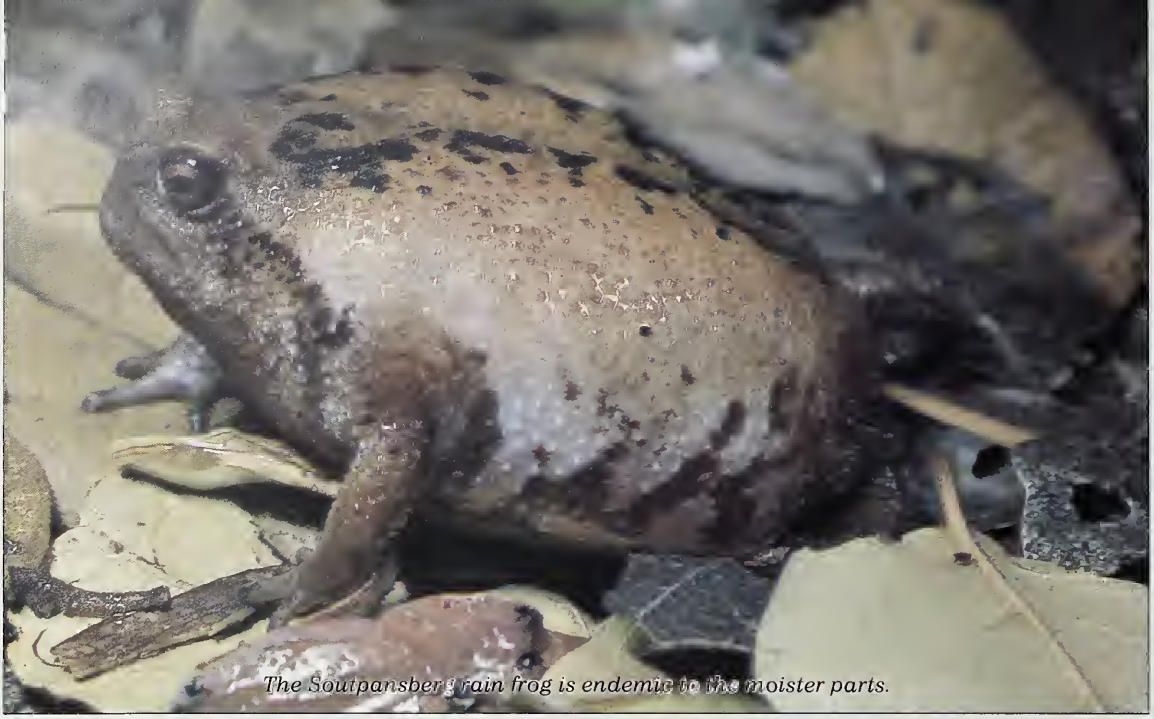
The wax tube leading into the mopane bees nest gives little indication of the nectar therein.

Deeper into the forest but not far away, a frog hops out of the way. Buffy-brown with a broad golden-yellow stripe down its back, it is presently regarded as a forest form of the clicking stream frog *Rana grayii*. The stream frog is, however, usually found in open, grassy upland areas and this forest frog may represent a new as yet undescribed form. As the clouds gather and the earth becomes cool and moist, a shrill trilling call is heard. This



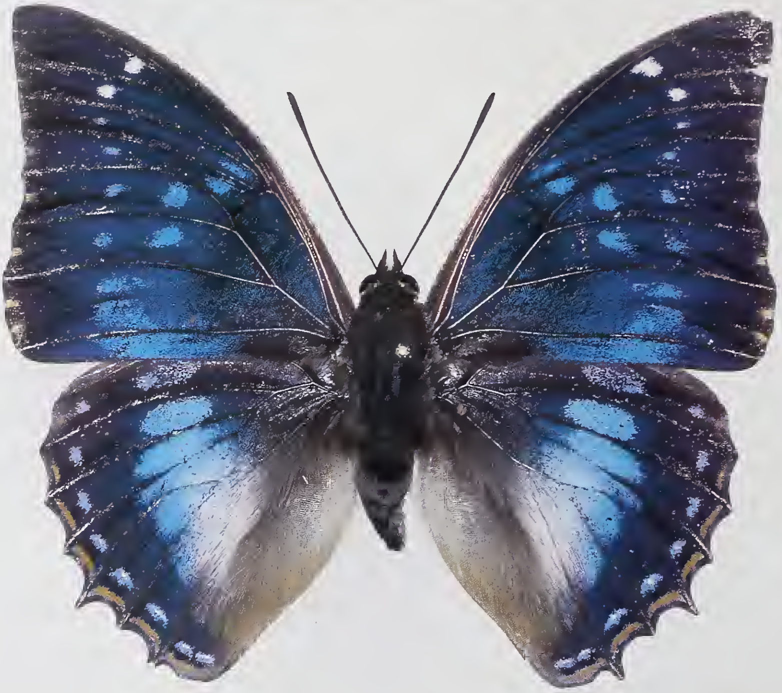
The Soutpansberg rain frog is endemic to the moister parts.

N. JACOBSEN

belongs to the Soutpansberg rain frog *Breviceps sylvestris taeniatus,* calling because of the increase in humidity. These snub-nosed frogs spend the day in burrows dug into the soft soil with their hind-feet, emerging only during periods of high humidity and at night, to feed on termites, of which they consume vast numbers. They are adapted to a terrestrial life, unable to swim, and do not breed in water as most other frogs do. Instead they lay a few large eggs in an underground chamber, the tadpoles develop and metamorphose in the eggs and emerge as miniatures of the adults.

Penetrate deeper into the forest and suddenly you are isolated by the mist swirling round you, even the bird calls are muted and the only sound is the drip of water dropping onto the leaves of the forest floor. Yet not far away, a few kilometers at most, the sun is shining and dry winds stir the leaves on the slopes. At a lake called Fundudzi, Venda maidens are performing the Python Dance in anticipation of the rain that is going to fall. The magic of the Soutpansberg is there.

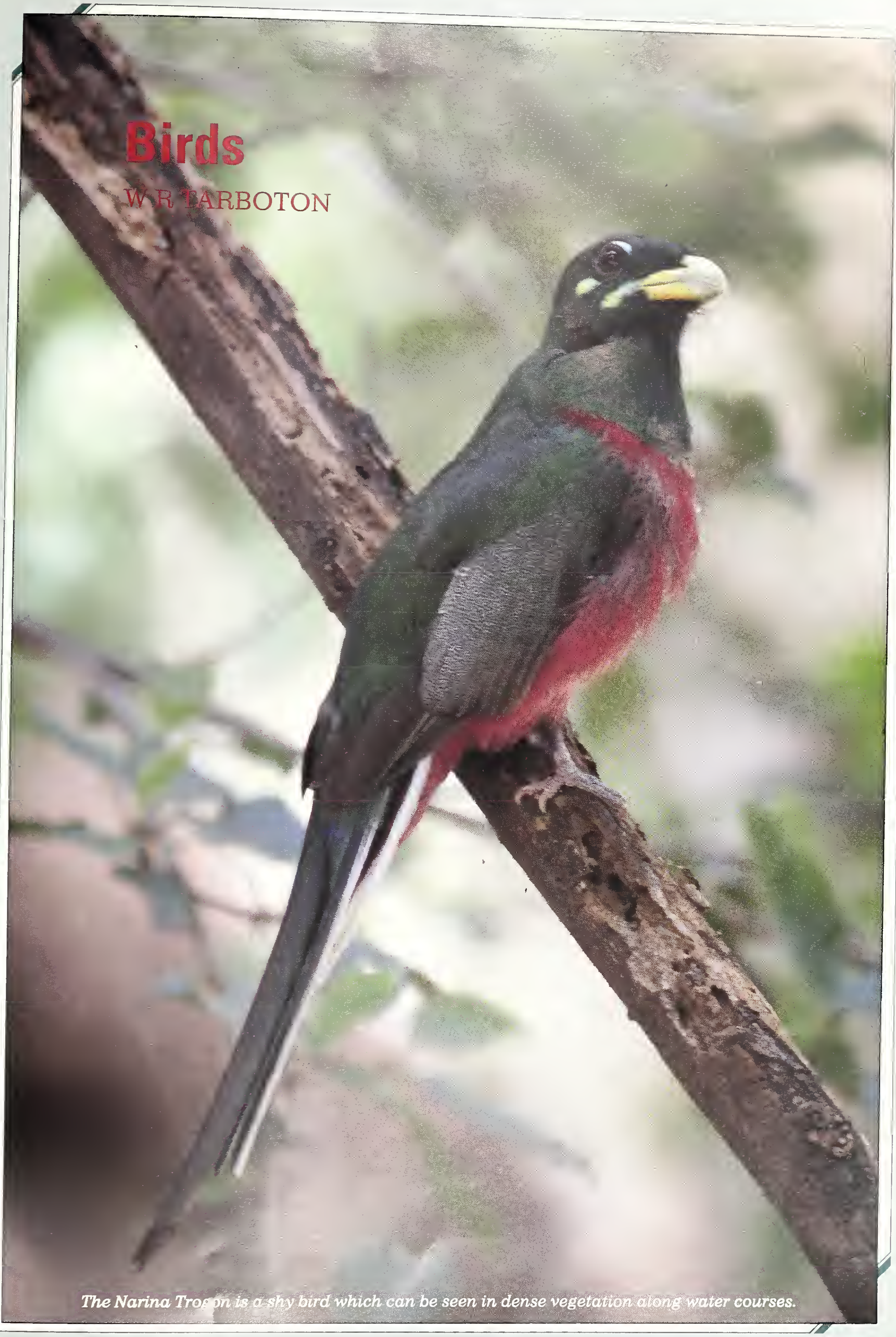
This Charaxes may be frequently seen flying across open glades in the forest.



JANET MATTHEWS

Birds

W R TARBOTON



The Narina Trogon is a shy bird which can be seen in dense vegetation along water courses.

W. R. TARBOTON

The exuberant 'kro-kro-kro-kro-kro-kro . . .' call of the Purplecrested Lourie, ringing out from a wooded hillside thicket, is one of the characteristic sounds of the Soutpansberg. This is a common, noisy and colourful bird, showing a flash of red wings as it flaps and glides from one bush clump to another, and it is familiar to most residents in the area. It is one of three species of lourie found in the Soutpansberg, and the respective distribution of each in the region is typical of the distribution patterns of many other bird species found here. The louries are of special interest as they are one of the few bird families that is endemic to the African continent.

Louries are plump, pigeon-sized birds with long tails and conspicuous crests, living in trees and feeding mainly on fruit. The most colourful of the trio is the Knysna Lourie, a velvety green-coloured bird, with a white-tipped crest and rich red wings that burst into colour when the bird flies. It is restricted to the tall, evergreen, montane forests. The second species, the Purplecrested Lourie, is slightly less colourful and it frequents the moist woodlands that are intermediate between forest and arid bushveld; these birds often come into gardens in Louis Trichardt and they range into otherwise arid country along rivers lined with tall trees. The third member is the sombre-coloured Grey Lourie which is found in the arid bushveld that stretches from the mountain's northern slopes to the Limpopo and beyond.

W. R. TARBOTON

Blackheaded Orioles are common birds throughout the mount

Elsewhere in this issue the climatic gradients found in the Soutpansberg and the effects of these on vegetation are described more fully: in a nutshell, rainfall diminishes from east to west and from south to north, and correspondingly, forests are restricted to the mountain's southern slopes and are most extensively developed in the east, while arid savanna stretches away northwards from the mountain's northern slopes. In between, moist woodland occurs, grading on the one hand into forest and on the other into arid savanna. Thus the three broad habitat types occupied by the louries — forest, moist woodland and arid savanna — cover most of the Soutpansberg, and the majority of terrestrial bird species occurring in the region are restricted to one or other of these. If these, plus aquatic species, plus all the vagrants and accidentals recorded are included, some 380 bird species have been recorded on the mountain.

Let us look first at some of the species that share the Knysna Lourie's montane forest habitat. There is not a great diversity of birds to be found in these dark and often wet forests, perhaps 50 - 60 species in all, but many of them have special interest in that they are totally restricted to this habitat and as a result have small, fragmented ranges. It is not an easy habitat in which to see birds — the light is poor and often dappled, many of the species are shy or else stay high in the leafy canopy of the trees, 20 m or more above one's head, and it is often wet. The best technique is to find a vantage point in the forest and sit quietly and listen: an ideal spot for this is at the picnic site in the Hanglip State Forest.

The first bird sound to be heard will probably be the sweet notes of the Cape White-eye which is common, not only in the canopy of the forest, but also in the surrounding woodlands. Alongside, the twittering call of the Lesser Doublecollared Sunbird will soon be heard, and perhaps soon after the galloping little song of a Barthroated Apalis. Presently a movement catches one's eye, and a Chorister Robin settles on a nearby creeper stem a few meters above the ground, head cocked, alert, and the owner of the warm, melodious song, heard earlier, is identified. Then scratching in the leaf litter on the forest floor nearby, below a tangle of vegetation and punctuated by harsh, churring notes, heralds the arrival of a group of Terrestrial Bulbuls. They prove more difficult to see than the robin. High up in the forest canopy a sudden explosion of movement occurs, accompanied by a harsh, rasping 'hrrr-hrrr-hrrr-hrrr . . . ' sound. Is it monkeys? No — a flash of red wings identifies the culprits as Knysna Louries. Most of the forest birds, however, are not as obliging in showing themselves, and unless we know that the frog-like, rising 'prrrrriit' sound coming from the canopy is being made by a Scalythroated Honeyguide, or the series of rounded hooting notes is the territorial call of the Narina Trogon, we will be none the wiser that these species are present. These and others like them go about their business in the forest unobtrusively and it is a matter of luck encountering them. Several forest bird species are listed in the South African Red

ar.

Background Photo:
Cape Vultures are commonly seen soaring through the skies of the Soutpansberg.

Data Book and at least one, the Blackfronted Bush Shrike, occurs widely in the Soutpansberg's forests.

The moist woodland habitat frequented by the Purplecrested Lourie supports the greatest diversity of terrestrial bird species in the Soutpansberg and more than 100 species are represented here. Much of this habitat, where the slope has permitted it, has been cleared for agriculture or afforestation, and no extensive tracts of the woodland have been left intact, except on the steeper slopes. Among the commonest bird species found here are the Blackeyed Bulbul, Cape White-eye, Speckled Mousebird and Barthroated Apalis, all species which also use the forests to some extent. Other common species are Green Pigeon, Blackcollared Barbet, Blackheaded Oriole, Yellowbreasted Apalis, and various cuckoos and shrikes. One of the most colourful of the latter species, but also the shyest, is the Gorgeous Bush Shrike, a denizen of dense, tangled acacia thickets, whose presence is often announced by its bold 'kong, kong, quoit'. Living in the same thickets one also finds the odd-looking, secretive Crested Guineafowl whose guttural call is reminiscent of the familiar 'tak-aaak' whistle of the common Helmeted Guineafowl. Two others found in this habitat — the Bluespotted Dove and Goldenbacked Pytelia — are listed South African Red Data species. They are elusive and little is known of their status or habits. The orchards of avocados and tropical fruit that have replaced much of the original woodland have attracted many species typical of more open country — species like the Yellowrumped Widow, Yellow-eyed Canary and Bronze Mannikin.

To see some of the arid savanna bird species one really needs to leave the Soutpansberg and move north into the flat, knob thorn or commiphora country; an ideal venue for this is the Langjan Nature Reserve, lying about 20 km north of the mountain. Here species like the Crimsonbreasted Shrike, Pied Babbler, Marico Flycatcher, Barred Warbler and Cape Penduline Tit are common, but they peter out as one reaches, and starts climbing the northern slopes of the range. These sparsely bushed, rocky northern slopes are frequented mainly by rock-loving species like the Rock Bunting and Lazy Cisticola.

The rocky habitats, and especially the spectacular cliffs found in the Soutpansberg provide breeding sites for many birds, especially birds of prey. Most common among the cliff-nesters are undoubtedly the swifts (three species — the Little, Black and Alpine) and at dusk and dawn when they leave and return to their nesting and roosting crevices, the sky in front of the cliffs is filled with these birds, and the air is vibrant with their shrill screaming. Another common cliff-nester is the Redwinged Starling, a blackish-coloured bird with rufous wings, which leaves the cliffs during the day to feed on fruit in the surrounding bush and is often seen in flocks.

The Black Eagle is probably the most dramatic of the Soutpansberg's birds of prey, of which 38 species have been recorded thus far. It is especially common in the drier western areas and 22 pairs are known to nest on the cliffs lying west of the Sand River. The largest-recorded eagle nest in southern Africa, a massive structure of sticks, 4,1 m high, belongs to one of these pairs. Cape Vultures are also commonly seen in the western Soutpansberg and about 100 pairs nest at two colonies just west of the Sand River. A much larger colony, supporting more than 800 pairs, is located further west, in the Blouberg. The Cape Vulture is another one of South Africa's Red Data species and these three colonies support about one quarter of the bird's total population. Other Red Data species which breed in small numbers in the Soutpansberg are the Peregrine Falcon and Black Stork.

Most of the Soutpansberg's birds of prey, however, do not live on the cliffs but use the mountain's forests and tall trees for nest sites. The huge baobabs found along the northern slopes, for example, are favourite nest sites for Martial and African Hawk Eagles, and in the forests and mature eucalypt plantations Crowned Eagles build their large stick nests. The Forestry Branch of the Department of Environment Affairs has recently adopted the policy of not felling trees which contain eagle nests and several Crowned Eagle pairs, one just outside Louis Trichardt, have benefitted from this consideration. The last of this group deserving mention is the Bat Hawk, a rare, little known bird of prey that hunts bats in flight at dawn and dusk and hides up in tall, leafy trees for the rest of the time. It is

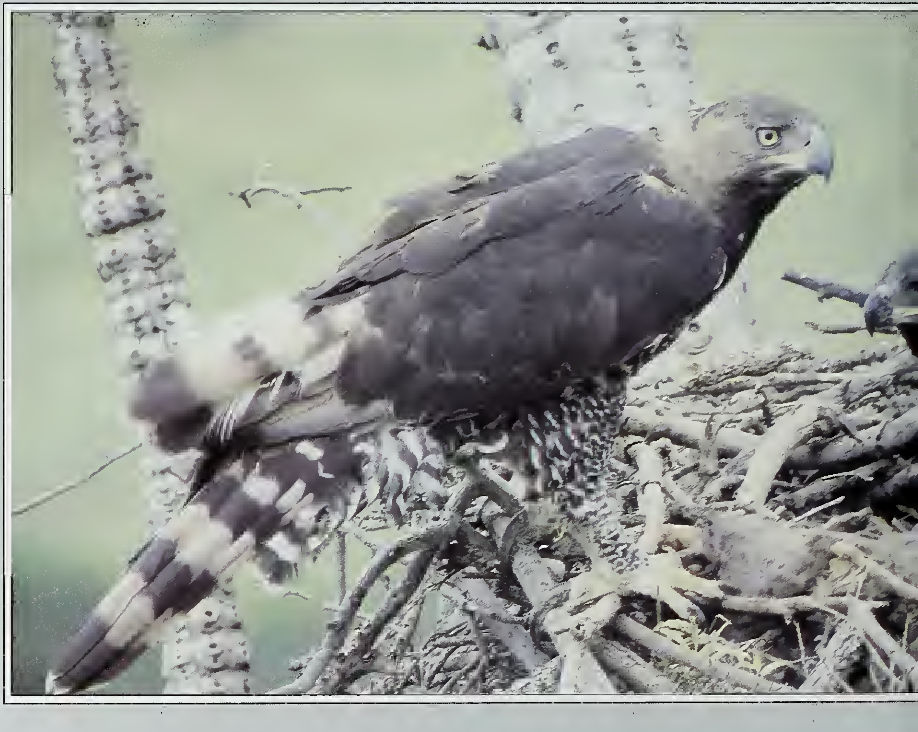
W. R. TARBOTON

Majestic Black Eagles are usually associated with high cliffs where they nest.

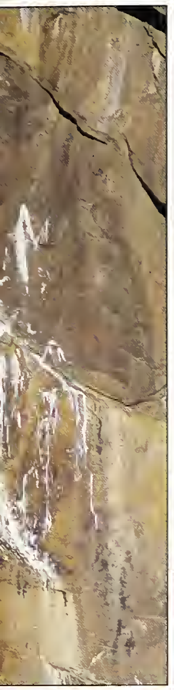
another of South Africa's Red Data species and one of the country's few known nesting pairs occurs in this range.

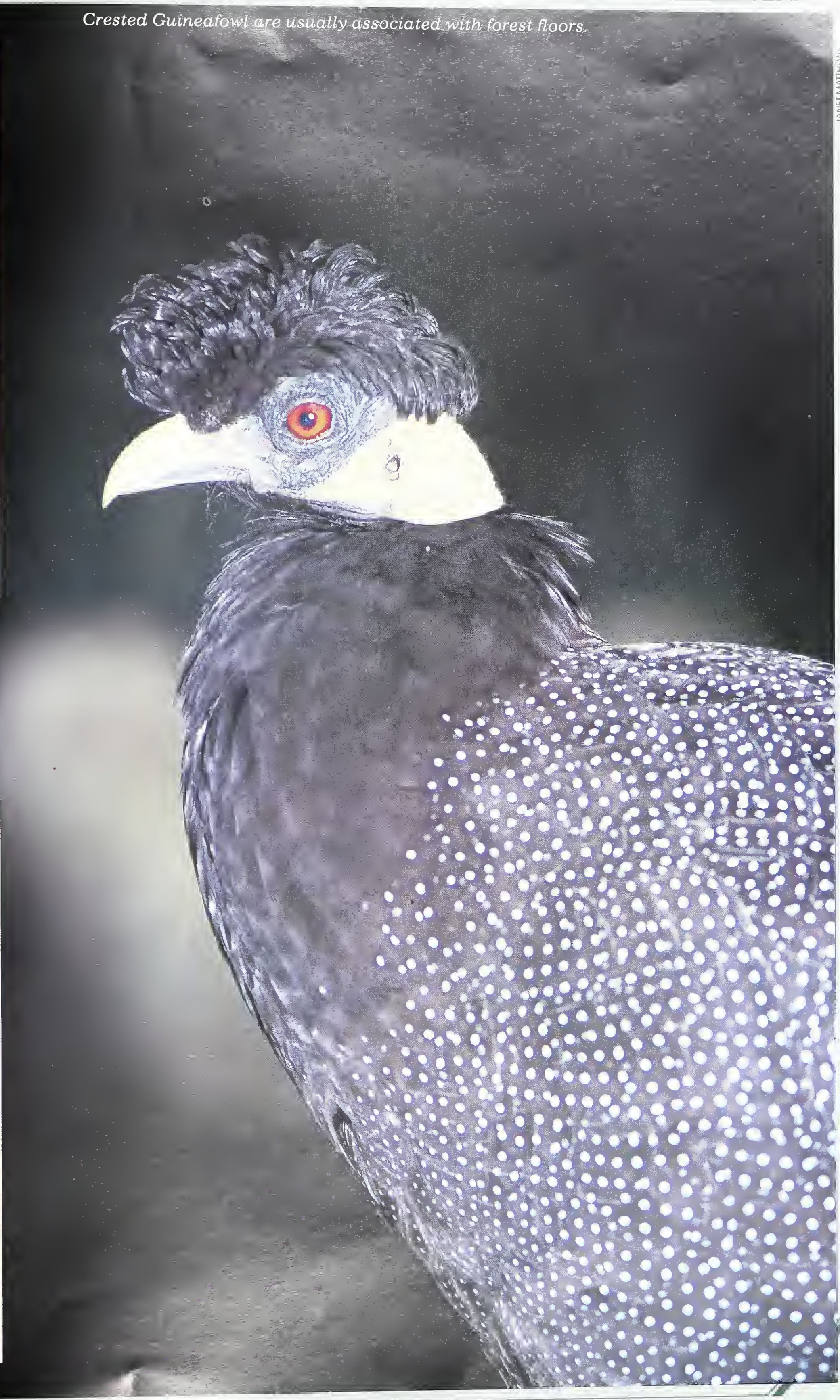
Much still remains to be learnt of the Soutpansberg's birds, and especially of the status and habits of some of the rare species mentioned. In the case of tropical species like the Bluespotted Dove and Goldenbacked Pytelia it seems that the Soutpansberg affords the only suitable habitat for them in South Africa. What it is that restricts these birds to this region, and what their exact requirements are, needs to be established if their populations here are to be conserved. The landowners in this unique mountain range have a vital role to play in this exciting challenge.

G. BATCHELOR



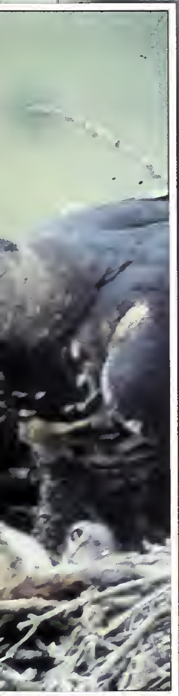
Crowned Eagles are powerful raptors which breed in tall trees in the forests of the mountain.





Crested Guineafowl are usually associated with forest floors.

JANET MATTHEWS



JANET MATHEWS

A typically traditional Venda homestead at the foot of the Soutpansberg mountain range.

The romance of a frontier

S M MILLER and J W N TEMPELHOFF[1]

An early pioneer's house forming part of the museum at Schoemansdal.

JANET MATHEWS

INTRODUCTION

The Soutpansberg, the most northern mountain range in South Africa, has always held a particular fascination to man and has proved suitable for human settlement for many centuries. A Scandanavian explorer visiting the area during the nineteenth century described the mountain as, "een landstreek van altijd wisselende skoonheid" (a landscape of continually changing beauty)[2].

Over the centuries the mountain and environs have been a meeting ground where people of diverse cultures have come together. Seen in the context of a frontier it is possible to describe habitation as occurring in a series of "waves" of settlers who had to learn to adapt to prevailing natural and social circumstances.

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Done by a Stone Age artist, one of the many rock paintings to be found along the Soutpansberg.

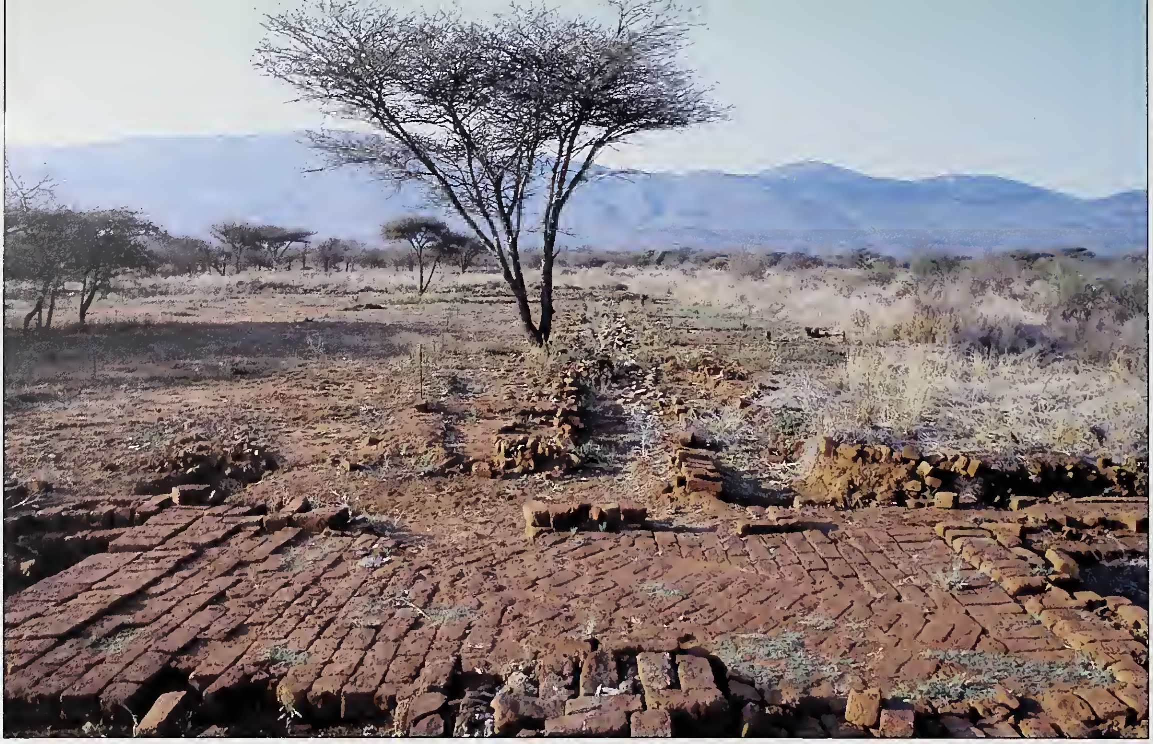
PREHISTORY

The earliest inhabitants of the Soutpansberg were people of the so-called Pietersberg Industry[3]. They were a stone-age hunter-gatherer community who also manufactured a variety of stone implements. It is generally accepted that they lived in the Soutpansberg area more than 50 000 years ago. Because current scientific dating methods are unreliable for periods exceeding 50 000 years it is likely that stone-age people lived in the area long before this[4].

Following in their footsteps were people of the late stone-age. Cultural remains of these people occur commonly in the area but little research has to date been done on them. An excavation at Makabeng — one of the best examples of the Smithfield culture — indicates that they lived in the area, also as hunter-gatherers, until about 930 AD[5]. Their artifacts and the presence of rock paintings show that their culture was different and more complex than that of the earlier inhabitants of the region.

Through their artwork these people left valuable historical documentation which tells us much about the presence and distribution of the local wildlife. The best known of these paintings is that of the elephant found on the farm Boslea, west of Louis Trichardt. Other paintings may be found on the farms Nellie's Garden, Leek, Ladysmith and Ventersdorp. In the dry area north of the mountain paintings are also found at the saltpan on the farm Driehoek, as well as the area surrounding Tshipese and the rest of the Limpopo valley[6].

(See references on p. 39)



Excavations on the old Voortrekker village of Schoemansdal done in recent years by Transvaal Directorate of Museum Service.

BLACK COMMUNITIES

It is accepted that people from the iron-age maintained a lifestyle more advanced than that of their predecessors. These communities possessed the ability to manufacture and use metal artifacts. Iron-age communities inhabited areas in the Northern Transvaal as early as 1 700 years ago. Remains which can be dated to as far back as 270 AD have been found on the farm Silver Leaves[7]. These people were not hunter-gatherers like their predecessors, but pastoralists and agriculturalists. Two of the most famous examples of the iron-age period may be found in the Soutpansberg. The farm Klein-Afrika, north of Wyllie's Poort, was inhabited as early as 330 AD[8] and Happy Rest was inhabited in about 600 AD[9].

Dates furnished above are presently under revision since current research is proving that dates can be far more recent than was previously accepted. Variations of one or two centuries can be anticipated[10].

These iron-age people were probably the predecessors of the black communities who later settled in the Northern Transvaal. Mapungubwe on the banks of the Limpopo River is one of the most interesting examples of the early-iron age period. It was one of the busiest centres between 950 and 1 200 AD and it was here that people manufactured metal artifacts, farmed and traded with each other[11]. Similar sites occur at Messina and Phalaborwa[12]. At Messina copper was mined and worked by people of the Musina Community.

After 1000 AD there was a power shift from Mapungubwe to Greater Zimbabwe. The main movements taking place between 1270 and 1450 AD. Some of the factors that contributed to this movement was the decline in the availability of grazing, the growth of the gold trade in Zimbabwe coupled with improved trade routes between the interior and the harbour cities of the east coast. Cultural exchanges, however, continued between Zimbabwe and the Soutpansberg. Evidence of this may be found at the Macemma site just north of Waterpoort[13].

Since the thirteenth century a variety of black communities started to settle in the Soutpansberg. It was these people who were later to become known as the Venda. These communities were part of a much larger migration of black people who had moved out from the northern areas of Africa. While Nguni speaking people were settling along the east coast between the Eastern Cape and Zululand the Venda were settling in and around the Soutpansberg. During this period they controlled most of this area.

The nineteenth century saw the Tsonga-Shangane people from Mozambique move into the easterly edges of the mountain. Part of the Nguni community and under the leadership of Soshangane, these people moved north-west from Natal to the Soutpansberg as a result of the Difaqane/Mfecane (a period of intertribal conflict during the latter part of the eighteenth and early nineteenth century). The prevailing state of unrest in Mozambique and the fact that Europeans were successfully settling around the Soutpansberg encouraged the Tsonga to settle in the area as well[14]. South of the mountain the North Sotho had already settled in great numbers[15].

(See references on p. 39)

THE ARRIVAL OF THE EUROPEANS

The first Europeans to visit the mountain probably did so during the early part of the eighteenth century. In 1725 a Dutch expedition did a reconnaissance of the area as far north as the Crocodile River which includes the area now situated in the Kruger National Park[16]. It was accepted that a journey from the east coast to Yzerberg, a hill south of the Soutpansberg, took about nine days to complete[17]. Unfortunately, the Portuguese traders who left little documentation, more than likely made contact with the resident population in the Soutpansberg before the end of the eighteenth century. It is accepted, therefore, that the Soutpansberg until the arrival of the Europeans was regarded as a frontier where different black communities competed for territory around the mountain.

Coenraad de Buys, a Cape born adventurer, is reputed to have been the first European from the Cape to settle in the Soutpansberg[18]. According to tradition, Buys, his coloured wife and their children entered the region between 1810 and 1820. His wife died after suffering from malaria. Buys then instructed his children to remain behind whilst he travelled to Portuguese East Africa to find help. He never returned. It is thought that he died while still on his way to the coast. Once his children realized that their father would not return, they splintered. Some stayed in the region, while the rest sought residence elsewhere in the Transvaal[19].

The next Europeans to reach the Soutpansberg were the Voortrekkers led by Langhans van Rensburg during the 1830s. They moved eastwards during the June of 1836 but were apparently killed by hostile blacks[20]. The Voortrekker community under the leadership of Louis Tregardt settled in the area between September 1836 and May 1838. They first settled to the west of the mountain at the saltpan but later moved to the site of Schoemansdal as well as to the area where the town of Louis Trichardt now stands.

The Soutpansberg was apparently chosen by the settlers because of favourable environmental factors. From Tregardt's dairy it is evident that the boers had many cattle requiring adequate grazing which the plains west of the range could provide[21]. Game also abounded in the region and the Boers, who were keen hunters, partook fervidly in this pastime[22].

While Tregardt's people were living near the mountain, they were visited by another group of trekkers led by Commandant Andries Potgieter in 1836. The two parties agreed to remain in the area and decided to settle at the town which was later to be called Schoemansdal[23]. Nothing happened about this arrangement for the next decade. Potgieter appeared too busy establishing Voortrekker communities to the south and set up headquarters for himself at Ohrigstad in order to be closer to the Portuguese coast.

After a brief sojourn in the unhealthy Lowveld Potgieter and his followers moved back to the Soutpansberg and began to establish the town Soutpansbergdorp[24]. There is no reason explaining Potgieter's move but it is thought that he wanted to improve contact with the Portuguese and needed an area with a healthy climate, free of malaria and tsetse fly which also provided suitable grazing for cattle[25].

The original name of the town was Soutpansbergdorp, also called Oudedorp, but the name was later changed to Schoemansdal. It was during these years, the 1850s, that General Stephanus Schoeman took over the political and military leadership of this frontier community[26].

(See references on p. 39)

The tragic legacy of the modern age, drought and the rapid rate of urbanization has led to the evacuation of many homes along the mountain range.

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Thomas' watermill at Elim has milled many tons of maize and sorghum from the late nineteen hundreds to well into the twentieth century. It was also used to generate the first electricity power at the foot of the mountain.

For a period of nineteen years Schoemansdal remained the most important trading centre in the Northern Transvaal. Thousands of tons of game skins, horns, whips, wood and salt were exported. Transport riders carried the goods to Mozambique, Natal and the Cape Colony[27]. The amounts that were traded can never be accurately calculated but estimates can be made based on information by visitors to the area. A Portuguese group, for example, paid a visit to the Schoemansdal community between July 1855 and June 1856[28]. Father Joaquim de Santa Rita Montanha was part of this group and it was he who compiled a report in which valuable information on Schoemansdal can be found. According to him the town consisted of 260 families but archaeological research suggests that there were only 100 families in the town[29]. The rest of the families probably lived on farms in the surrounding areas[30]. It is estimated that this community annually consumed 10 455 kg of gunpowder and about 1 800 kg of lead. It is further calculated that, to that date, 90 900 kg of ivory was exported from Schoemansdal[31].

All in all the natural potential of the area provided the settlers with exceptional circumstances under which they could settle. The sweet veld to the south of the mountain was ideal for their cattle and due to the abundance of game hunting became one of the biggest and most important industries of the community.

Then in 1867 Schoemansdal had to be evacuated as a result of the poor relations prevailing between the whites and the Venda leader Makhado. Factors aggravating the situation was the decline in the availability of game and the presence of malaria which caused the death of a great many people. By the end of the 1860s Schoemansdal was frequented only by cattle farmers and hunters who travelled from all corners of the Zuid-Afrikaansche Republiek (ZAR) to the Northern Transvaal during the winter months.

Coinciding with this, was an overall move away from all parts of the Northern Transvaal to as far south as Potgietersrus. Only nucleus populations remained in places like Rhenosterpoort, Marabastad and Houtbosdorp. As far as the Soutpansberg was concerned, a small group of whites lived near a Portuguese trader Joao Albasini, at Goedewensch[32]. Missionaries who had started activities as early as 1862 remained in relatively few numbers in various parts of the mountain.

During 1876 a trader by the name of John Cooksley started a trading concern on the farm Lovedale Park close to Elim. In the ensuing years this area, just south of the Soutpansberg, experienced good economic growth[33].

Then in 1886 the Government of the ZAR introduced measures to attract settlers back to the Northern Transvaal. This was initiated by the huge influx of immigrants to the goldfields of the Witwatersrand which resulted in population pressure on the rapidly growing urban areas. In July of 1886 the town of Pietersburg was established and in the same month the Volksraad approved Law Number 8 of 1886, the "Occupatiewet voor gouvernementsgronden in het district Zoutpansberg en een deel van Waterberg"[34]. This law made provision for

(See references on p. 39)

the allocation of free farms to settlers who complied to certain regulations. Farms would range from 500 to 1 500 morgen but had to be occupied permanently while occupants had to pay the registration and surveying costs as well as meet their tax responsibilities[35]. This caused thousands of people, from all parts of the Transvaal, to stream to this part of the Northern Transvaal. Regions like Spelonken along the eastern part of the mountain for example, increased in population from 74 in 1873 to 626 in 1890[36].

However, the Soutpansberg still did not provide favourable conditions for people to live under. The Venda still regarded the area north of the Doorn- and Levubu Rivers as theirs and whites were only allowed to settle with any degree of safety by consent from Makhado and if they did so near the mountain and east of Schoemansdal[37]. General Piet Joubert, Chief of Defence and Superintendent of Native Affairs of the ZAR tried, in vein, to negotiate a settlement with Makhado at Elim in 1889. Unfortunately the General's attempts at finding peace failed and some farmers, as a result, had to be evacuated.

Various attempts were made to attract more people to settle near the mountain. Measures, for example, were taken to establish the town of Mareville near Elim but again nothing came of this. At this time there was squabbling amongst the Venda leaders which gave rise to the government announcing that a town would be established on the farm Rietvlei right next to Makhado's village. Then in 1892 the district's magistrate, G C Munnik, was ordered by the Government to search the mountain for a suitable area for a new town. The original location of the Buys community was considered but this idea was later dropped.

During 1890-1 a transport route, west of the Soutpansberg, came into existance. It was this route that Cecil John Rhodes' Chartered Company had forged and as a result opened up the area north of the Limpopo River which was later to become Rhodesia. The road was used by hunters and traders moving into the new territory and in so doing had become acquinted with the Soutpansberg itself. During this time a lively trade existed between the Soutpansberg and the area to the north.

By the end of 1898 the ZAR had led a successful campaign against Mphephu, the successor to Makhado. As a result the Venda leader was forced to retreat to the other side of the Limpopo and was only to return to the Transvaal in 1905[38].

Directly after the war the government commenced with its own development programme. At the request of Colonel SPE Trichardt, grandson of the Voortrekker leader, the town of Louis Trichardt, was established. One of the first tasks to be completed was the choosing of a suitable site for the church. Coincidently, the cornerstone of the church was a piece of rock splintered by a bomb during the war. The rock had originally stood in front of Mphephu's village[39].

Within months of the end of the Mphephu-war people streamed back to the Soutpansberg area to take full advantage of the "Okkupasiewet"[40]. Unfortunately the outbreak of the Anglo-Boer War (1899 - 1902) brought all development in the region to a halt for the time being.

Settling did again begin in 1903 when British soldiers from the war were given farms to develop. Some Boer farmers who lived in the area before the war were also allowed to resettle there. Few farms were actually registered before the war and documentation that did exist was lost during the Anglo-Boer War.[41] A commission was therefore established by the British authorities to deal with the allocation of ground which eventually commenced in 1907.

Isolated communities did settle around the mountain in the early twentieth century. A small railway station was established at Waterpoort which is next to the Sand River where the line enters the mountain. Land was also given to soldiers returning from the First World War (1914 - 1918), this time at Waterpoort[42].

During the nineteen thirties the Education Department introduced a policy of centralization to reduce the number of schools in the province. The idea was to improve educational opportunities at fewer but more central locations. One such school, with boarding facilities, was established at Vivo[43]. Over the years it developed as a religious, trade and cultural centre for the local farming community.

Louis Trichardt developed quickly. During 1902 a management committee was responsible for local affairs. In 1912 a health committee was established which was changed three years later to a town council. In 1934 Louis Trichardt received full municipal status[44].

Louis Trichardt, until the end of the nineteenth century represented the northernmost settlement of whites in the ZAR. After the Anglo-Boer War the Colony of the Transvaal, like Rhodesia, became part of a still growing British Empire. The result was that the northern border of the Republic disappeared for a period of about 80 years.

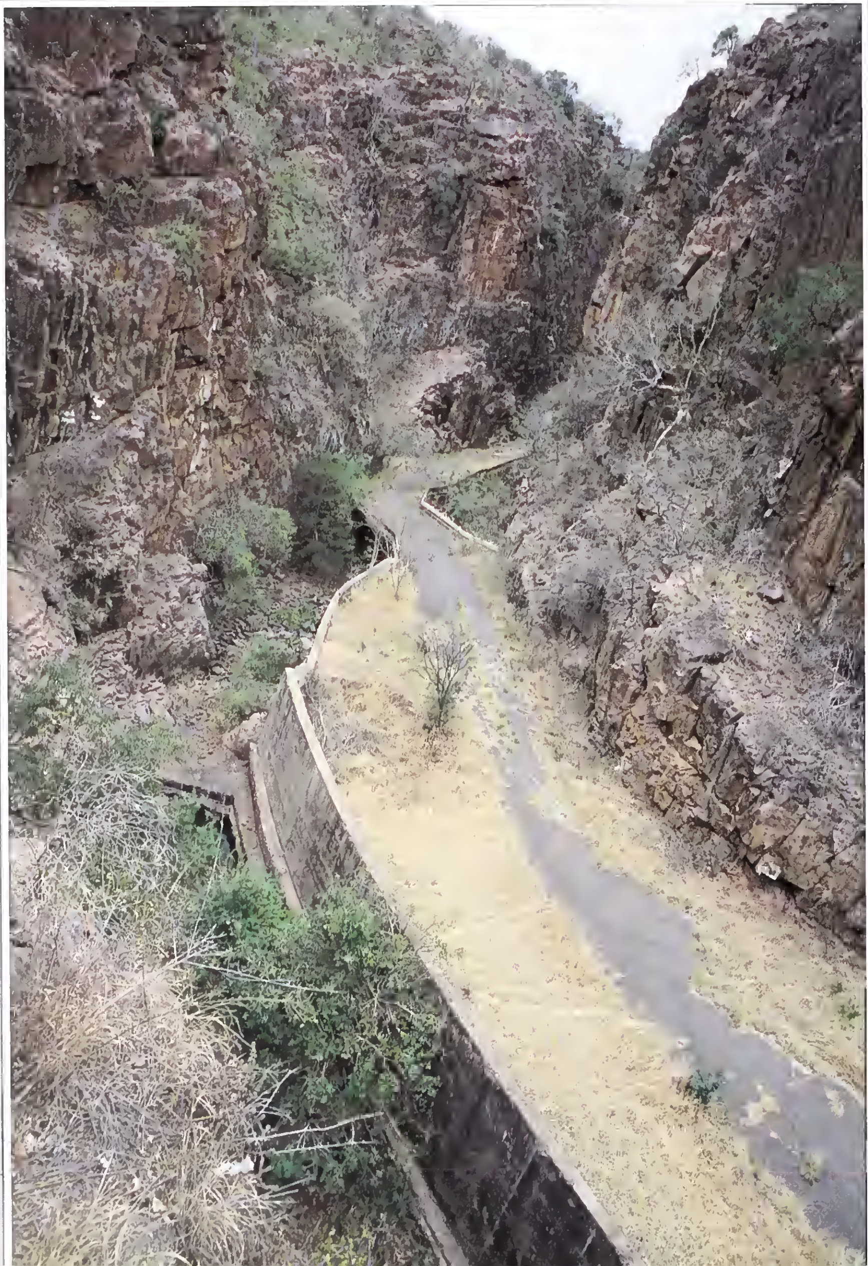
The mining of copper commenced at Messina, on the northern border of South Africa, in 1906. The demand for this mineral increased over the following decades, especially during the First World War. This gave rise to the need of a more direct access route through the mountain. The old route which passed between the Soutpansberg and the Blouberg, in the region of Rhenosterpoort, was too long a detour. Then in 1904 a British engineer by the name of Lieutenant C H Wyllie was commissioned by the authorities to construct a road through the mountain. This he completed in 1907[45]. The new road, at that time, was considered to be a masterpiece in road engineering. In 1914 a railroad was constructed which linked Messina and Bandelierskop. The line went through the mountain west of Louis Trichardt at Sandrivierpoort. Louis Trichardt itself was linked by railway to the rest of the network in 1913. These improved communication links greatly and contributed to the economic potential of the region.

(See references on p. 39)

CONCLUSION

Despite many developments having taken place in recent years, the Soutpansberg has remained unchanged. It is as impressive as ever. Also the people living in the region have ostensibly remained a frontier folk. Modern technology has brought certain comforts, but the characteristics of ruggedness, hardiness and hospitality have remained. The environment has been affected by man over the years, but only to the extent that the Soutpansberg has become an even more superb region for human settlement, its romance lives on.

(See references on p. 39)



JANET MATTHEWS

The old and new roads at Wyllie's Poort, both have played an integral part in linking the areas north and south of the mountain.

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Conclusion

G P VISAGIE

The preceding articles demonstrate clearly what a special area the Soutpansberg is, and they make a strong case for keeping this region unspoilt so that future generations can enjoy it as we have. The legal responsibility for doing this lies with the Directorate of Nature and Environmental Conservation but for practical and socio-economic reasons it would be impossible for the state to acquire and manage such a large area. Fortunately, though, a strong spirit of conservation flows in the blood of many of the mountain's landowners and they and the Directorate share many common goals.

One of the purposes of this issue of Fauna & Flora is to cement the bonds between the people of the Soutpansberg and the Directorate and to mutually secure the mountain's future.

The Directorate has, in the past decade, devoted much of its effort into researching and managing the fauna and flora of the mountain. Botanical surveys, which began here in 1980, have located populations of more than 30 rare and threatened plant species on the mountain, conservation plans have been formulated for seven of these and in one instance the plant is now being artificially propagated with a view to strengthen the numbers of depleted populations of the species. The Happy Rest Nature Reserve was enlarged in 1986 specifically to offer protection to a larger proportion of the Soutpansberg's population of the cycad *Encephalartos transvenosus*. A reptile and amphibian survey of the mountain was also undertaken in the 1980s and 14 rare and threatened species were found here together with previously undescribed chameleon and gecko species. The Cape Vultures, which have bred for many decades on the kranzes at Buffelspoort and Uniondale, have been aerially counted for the past nine years as part of a Transvaal-wide investigation into the status of this species. A similar province-wide survey of the Soutpansberg's population of red duiker received attention.

In the course of all these surveys numerous landowners were contacted and their interest in, and enthusiasm for the environment was obvious. It is understandable therefore why no less than seven properties here have been registered under the South African Natural Heritage Sites Programme.

We live in times in which our countries' natural resources are under enormous pressure from the demands of a rapidly expanding population and its insatiable thirst for more and more space and utilizable resources. The Soutpansberg's natural resources are not going to be spared from these demands. But there is also a growing demand for wilderness areas and wild places. Let us join hands in keeping the Soutpansberg as one of these places.

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THE OLIFANTS RIVER SYSTEM

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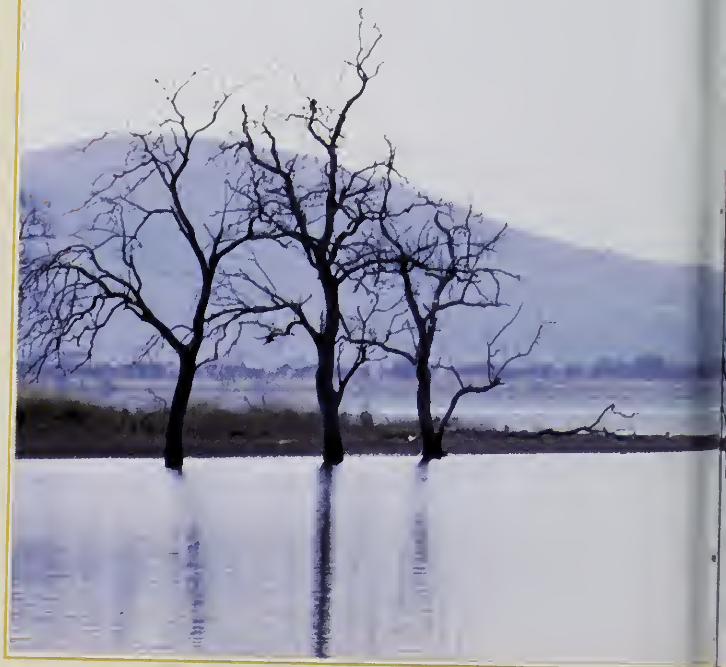
> "A river is a very peculiar thing. The conditions that are necessary to the life within it are such that, pondering them, one is almost obliged to doubt whether separate properties in running water were in the design of Nature. Injure a river at any point in its course, and you shall injure it from source to sea".
>
> W. Earl Hodgson (1919).

Rivers are considered by many to be merely furrows for the passage of water after rain, there to be used and abused. Although such an attitude may rise from ignorance it can be the cause of immense damage to a river system. Rivers are highly complex, dynamic ecological systems that have evolved over many millions of years.

During the pluvial wetter periods in the earth's history, the rivers in southern Africa were much larger than what we know them today. Consequently they were able to erode down landscapes, incise through mountain ranges and lower topography far more rapidly than is presently the case. Not only were they more efficient at erosion, but they enabled aquatic creatures to disperse over much of southern Africa. During the last pluvial, for example, the Zambezi River was connected to the Limpopo and Pongolo Rivers, and these channels enabled fish populations to colonise new drainage systems. As a result many fish species are shared by these now widely spaced rivers.

In contrast, during the drier interpluvial times, aquatic habitats shrunk, resulting in populations of some species becoming separated and geographically isolated. This isolation over time led to the evolution of new species: one example of this is the endangered Treur River barb, the entire population of which is confined above the waterfalls in the Blyde River.



The Olifants River

G R BATCHELOR

Together with the energy-giving sunlight, nutrients are the primary driving force of the biological system in a river. The nutrients have two origins: in the upper reaches they enter from outside the river, as, for example, leaves falling into the water. Further downstream more and more nutrients are generated within the river itself and these are transported down the course of the river. The subtle changes in water chemistry together with velocity and substrate-types, are mirrored by the faunal communities within the river ecosystem. It is not surprising that changes in land use practices may radically alter the faunal composition of a river.

The Olifants River is today reaping the whirlwind laid down 280 million years ago as the climates over Gondwanaland warmed after the last ice age. As areas dried out they were colonised by forests of cone bearing plants called gymnosperms. For over 10 million years these plants, including *Glossopteris* and *Gangomopteris*, flourished, only to be covered and compacted by hundreds of metres of soil and rock so forming the coal horizons of today. Years of erosion have now all but exposed these fossil beds. The sun's energy stored by those plants millions of years ago is now being sought after by man to energise his world. This process of extraction is leading to contamination of the water which discharges into the Olifants River.

Running water has an amazing ability to cleanse itself. This apparent cleansing ability of water is actually achieved by living organisms such as bacteria, algae and even higher plants. The capacity of these creatures to remove effluents has been put to good use in sewerage treatment plants where the natural process is speeded up. Rivers, however, have a limited capacity to absorb certain waste products. If the water becomes too polluted, the whole system may collapse. This point of no return is difficult to predict as it will alter according to the type and concentration of the pollutants as well as the combination of pollutants present.

This phenomenon is well illustrated in the Olifants River where it picks up pollutants along its course then suddenly, with an influent small tributary, the water becomes toxic to most faunal species. With a certain amount of dilution more tolerant species can again survive while, still lower downstream, the river has managed to purify itself to a degree that most species have returned.

The coal extraction on the Transvaal Highveld is but one of the problems being experienced by the Olifants River. There are many others and it is the purpose of this issue of Fauna & Flora to address these problems in an attempt to alert the public to the plight of the Olifants River, the Transvaal's second largest river.

JANET MATTHEWS

There was a river ...

C J KLEYNHANS

The Olifants River: a name that conjures up images of bygone days of an unspoiled Africa and vast herds of game. Unfortunately this idyllic image is a far cry from today's reality which is becoming something of a nightmare. It immediately brings to mind the words of T.S. Eliot ("The Dry Salvages"):

"I do not know much about gods: but I think that the river
Is a strong brown god — sullen, untamed and intractable,
Patient to some degree, at first recognised as a frontier;
Useful, untrustworthy, as a conveyor of commerce;
Then only a problem confronting the builder of bridges.
The problem once solved, the brown god is almost forgotten
By the dwellers in cities — ever, however, implacable,
Keeping his seasons and rages, destroyer, reminder
Of what men choose to forget. Unhonoured unpropitiated
By worshippers of the machine, but waiting, watching and waiting."

JANET MATTHEWS

What has happened to this area, once one of the jewels of our land, now so raped and pillaged that we as inhabitants of the land should hang our heads in shame? What lessons are to be learnt from this, and how should we be managing the aquatic systems in other catchment areas to prevent a repetition of the same tragedy from happening elsewhere? Considering all its problems, the Olifants River system is one of the very best examples of a river catchment in this country that has been used and abused and it would be foolish to ignore the changes that this has brought upon the natural components of the aquatic system.

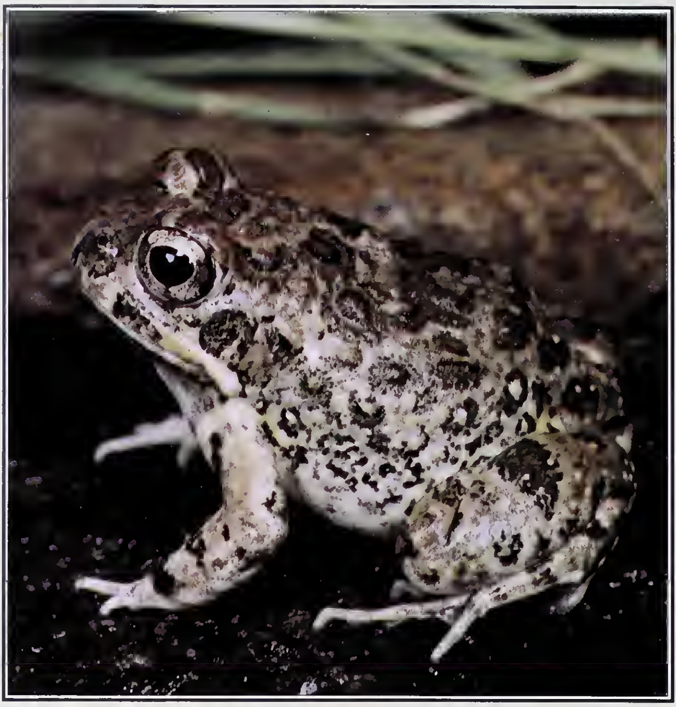
Harrison divided the Olifants River into four distinct hydrobiological regions: the Highveld, Middleveld, Transvaal Mountainland and Lowveld subtropical.

On the eastern Highveld important rivers such as the Bronkhorstspruit, the Wilge, Groot and Klein Olifants, and a small portion of the Steelpoort rise in the gently undulating plateau at altitudes between 1200 — 1800 m above sea level where the annual rainfall lies between 700 — 800 mm. The sources of these rivers are classified as springsand sponges, sometimes associated with vleis where there are depressions. Most of the Highveld streams are classified as foothill sandy-bed streams in which pools form along gentler slopes, alternating with foothill rocky-bed streams along which rapids occur wherever the slope increases. Thus on the Highveld the rivers leading into the Olifants system are mostly gentle flowing, interrupted here and there with babbling water where rocky areas are traversed. Grassveld is, in all respects, the most widespread vegetation found along the Highveld streams but shrubs and trees such as ouhout, karoo bluebush, sweet-thorn and river bushwillow occur here and there. Streams such as the Saalboomspruit straddle reedbeds which retard the river's flow and lead to sediment deposition. In these habitats of reeds, bullrushes and sedges one finds

A wetland area in the Eastern Transvaal

JOHAN ENGELBRECHT

The Olifants River has a catchment area of 54 500 square kilometres which constitutes 4,3 percent of the total surface area of South Africa, and 18,9 percent of the Transvaal (including the areas under the jurisdiction of the self governing areas and national states). The river's average annual run-off is 1 861 million cubic meters, some 3,5 percent of the total annual run-off in South Africa. On average, 660 mm of rain per annum falls in this catchment of which 6,6% reaches the river in the form of run-off. Because of the catchment's size, a variety of landscapes are drained by the Olifants River and the aquatic and riparian biota are, as a result, similarly diverse. This article provides a broad description of how the system would have looked in a more pristine condition.

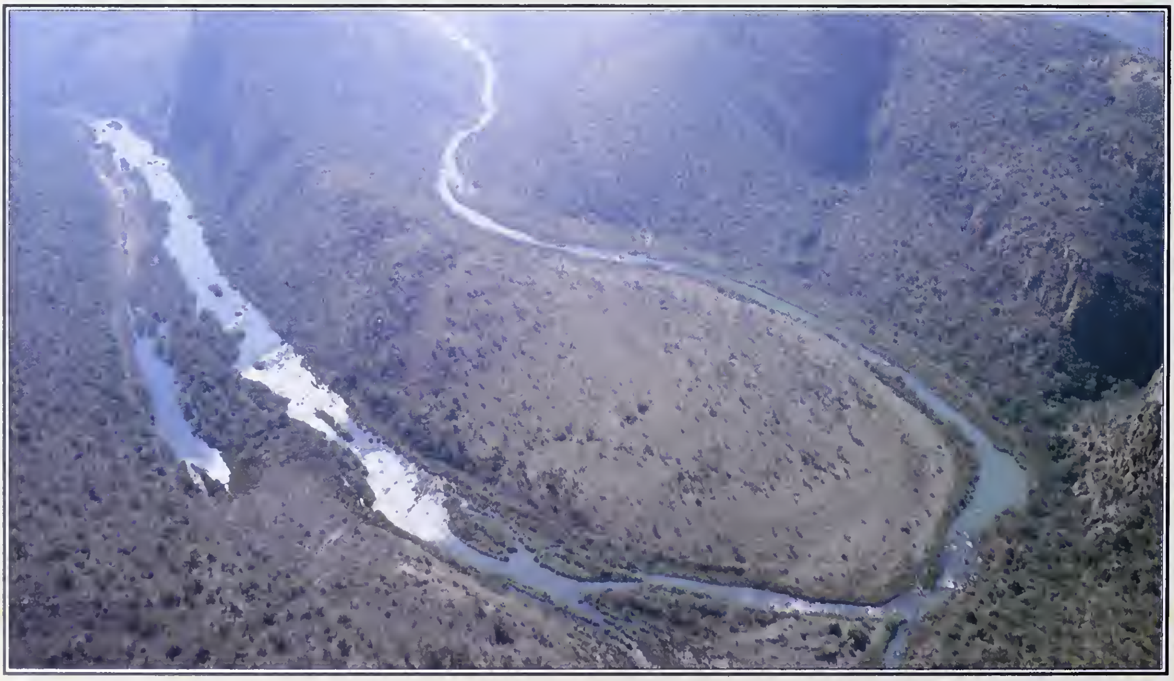

NATURE CONSERVATION

Striped Sand Frog

the African Marsh Harrier at home. After dark many amphibian species make their presence known in their noisy manner; for example the bullfrog, platannas and the striped stream frog. Large darting shoal of a variety of minnow species frequent the pools while vlei kurpers lurk below the shelter of grass overhanging the ponds, mindful of the presence of larger predators such as the sharptooth catfish. A closer investigation of the rapids reveals the presence of the shy common mountain catfish, concealed under the rocks; with a little more patience one may spot the rock catlets, a species which darts quickly from stone to stone, using its suction mouth to extract small food items from the stone surface. Some of the 14 indigenous fish species, including the small scale yellowfish, the rosefin barb, the common mountain catfish and the Limpopo rock catlet, occur in these Highveld rivers and are extremely sensitive to habitat deterioration.

The point where the Highveld grades into the Middleveld is scenically dramatic, with precipitous cliffs and ravines and a sourish mixed bushveld plant community. The river weaves back and forth as if seeking its way out of the Highveld. Everywhere towering cliffs dwarf the river's route and pools and rapids alternate along its course. From the air one would imagine the region to be a hostile, inaccessible wilderness: indeed the earliest white settlers referred to the region as "The Hell".

The "Hell". A rough wilderness


JANET MATTHEWS

River source sponges in the Transvaal Mountainous Region

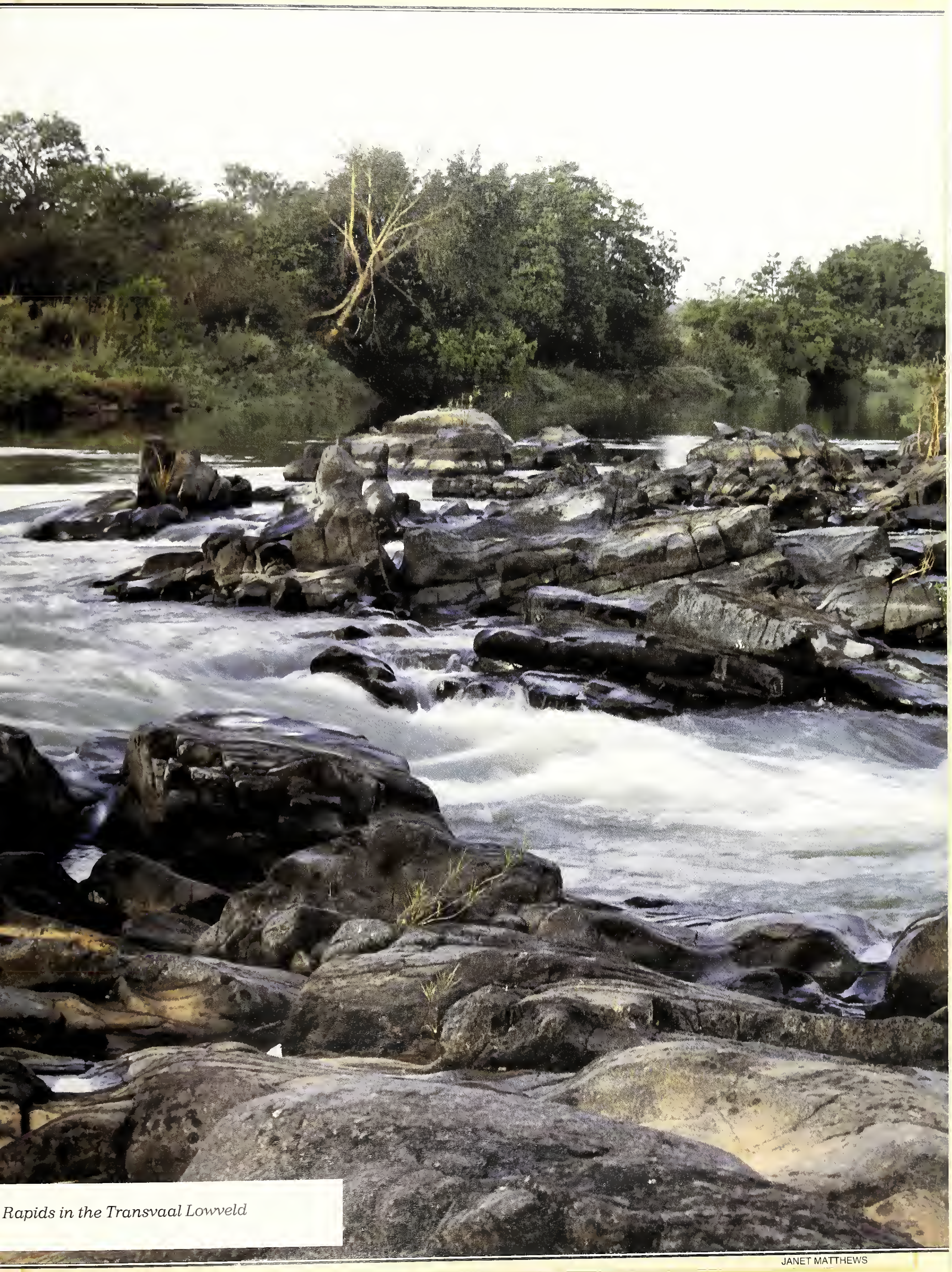
JANET MATTHEWS

Along the eastern side of the Olifants River catchment the Transvaal Mountainland is found at altitudes of 1500 — 2331 m above sea level. It is essentially mountainous with a high annual rainfall, ranging between 700 — 2000 mm, and is the system's most important area for water production. Important catchment streams here are the Steelpoort, Mohlapitse, Ohrigstad, Blyde and Klaserie Rivers. These rivers eventually flow into the Middle or Lowveld region. The Blyde River has carved out the spectacular Blyde Canyon on its route into the Lowveld.

The river source sponges, of which Lakenvlei near Belfast is a good example, are often notable features of the landscape of the highlying areas in which these rivers have their sources. These sponge areas and associated vleis have an important role in maintaining year-round flow of the streams. They often support interesting plant communities with a variety of grasses, lilies, orchids, arums and kniphofias and offer habitat to a variety of bird species including the rare Wattled Crane, while the Long-crested Eagle sometimes hunts vlei rats along their edges and the spotted-necked otter preys on the fish and crabs found there. With the exception of the sponges, where water flow is gentle, the streams in this area are lively and sparkling as a result of the rapid and often turbulent flow arising from the steep slopes. Cliff waterfalls and mountain streams are common and the water is clear, cool and aerated. An unusual feature found in some areas where the streams drain off dolomitic rocks are the fairy-

Water falls in the Transvaal Mountainous Region

JANET MATTHEWS



Rapids in the Transvaal Lowveld

JANET MATTHEWS

like tufa waterfalls. These form as a result of calcium carbonate, taken into solution upstream where the river traverse the dolomite, being deposited downstream, where it passes over other rock types, and the example found on the Kadishi River is well known to visitors to the Blyde area. Where the gradient is gentle foothill rocky bed streams with many pools, ponds and rapids, with waterfalls in places, may be found. In the pools in the upper-reaches of the Blyde River one finds the endemic and threatened Treur River barb lying in wait in the crystal-clear water for a mayfly nymph to leave its cover in an unguarded moment and become the minnow's next snack. In the rapids between the rocks one finds the shy Natal mountain catfish on the hunt for insect prey. Thirteen indigenous fish species are found in this region. Amphibia include the Natal ghost frog and the locally plentiful striped stream frog and common river frog.

Two veld types in particular are associated with this region, namely North-eastern Mountain Sourveld and North-eastern Sandy Highveld. Depending on local conditions, forests occur in certain kloofs and these often contain outstanding examples of real yellowwood, stinkwood, forest cussonia and white stinkwood. Otherwise the stream banks are mainly grassy, sometimes lined with trees and shrubs like safsaf willow, tree ferns and pigeonwood.

The Transvaal Middleveld Region lies at an altitude of 600 — 1200 m above sea level, with an average rainfall of between 500 — 600 mm a year. In this area the rivers flow quietly for most part over an even landscape, and are known as midland streams. The central section of the Olifants River, as well as the lower-lying parts of the Elands, Moses, Mohlapitse and Chunies Rivers are found here. Sand and silt deposition occurs along the beds of these rivers, and there are many broad, shallow sections, as well as pools. Although not common, hot water springs such as De Bad along the Spekboom River, with unusual communities of diatoms, are found in this region. In the lower-lying section of the Mohlapitse River a fairly extensive reedbed vlei occurs. River rejuvenation occurs where the rivers flow over erosion-resistant rocks, and where the Olifants River has cut through the Drakensberg a large ravine flanked by massive cliffs occurs. Riffle and rapid sections are associated with the rapid-flowing aquatic habitats found in such areas, and fish species more commonly found in the Mountain Region, like rock catlets and barred minnow, also occur here. A rich variety of 35 fish species find a home here, and species like red-breasted kurper, butter barbel, striped topminnow, and silver mudfish, which prefer relatively high water temperatures, are present. Reed-fringed ponds provide habitat for, amongst others, crocodiles, Cape terrapin, hippopotami, and water mongoose, the Cape clawless otter and the Giant Kingfisher prey here on fish and crabs. The banks are often well-wooded with good examples to be found of the sycomore fig, tambotie, monkey thorn, camelthorn, weeping schotia and paperback thorn. Sweet-thorn is, however, usually the commonest riparian tree. Mixed Bushveld is the dominant veld type, with Springbok Flats Turf Thornveld present in the western parts.

The Transvaal Lowveld is known for the great variety and numbers of large mammals which occurred here historically. This mainly undulating landscape lies at an altitude between 300 — 600 m above sea level. As in the case of the Middleveld Region, the rainfall is low, lying between 500 — 600 mm per annum. As a result few permanent streams originate in this area and their flow is slow as a result of the low gradients, except in places where rocky outcrops lead to rapids. Sand and silt depositions occur along the beds of the rivers and as in the case of the Middleveld the rivers are known as Midland streams. In human terms the rivers in this region have reached maturity and have shed the youthfulness which characterised their age in the Mountain Region.

The Blyde, Klaserie and Selati Rivers meet the Olifants River in the Lowveld. The Blyde in particular, with its permanent flow and clear water, makes a significant contribution to the Olifants River. Wooded islands occur frequently and large reed-fringed pools are abundant, providing ideal habitat for Cape terrapins, river hinged terrapin, tropical platanna, red-legged kassina and water lily frog, Nile monitor and crocodiles and hippopotami which rest on the sandbanks. Kingfishers such as the Giant and Pied are common. At its eastern edge the Olifants River leaves the Lowveld via a ravine in the Lebombo Mountains and crosses the Mozambican coastal plain where it is classified as a Lowland river. In general the banks are wooded with many large examples of sycomore fig, splendid acacia, jackal berry, matumi and water berry. Gallery forests occur along a few sections of the river. One such place is at the junction of the Blyde and Olifants Rivers where suitable habitat for Pel's Fishing Owl and also bushbuck is provided. A total of 37 fish species is found in this region as a result of the river's large size and the relatively high water temperatures that prevail, especially in the winter months. Most of these species match those found in the Middleveld Region, and only species like tiger fish, imberi and tank goby do not occur in the Middleveld Region.

This is a brief summary of how the Olifants River looked before any development took place. It must be kept in mind that only those biota associated with the aquatic system have been named. Many other species are indirectly dependent on the river's water and if these were taken into account it is clear that a multitude of life-forms depend on this river system. In its original condition the Olifants River system was a complex and dynamic ecosystem with integration of biotic and abiotic components. What has happened to the river since then is described in the following chapters.

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Destruction by plantations

The Upper-reaches

J ENGELBRECHT

INTRODUCTION

A network of literally thousands of kilometres of seemingly meaningless little streams and fountains in the Highveld and Mountain regions of the Transvaal form the source of the Olifants River, and because of this, the impact of the many forms of land-use in this catchment is not easily unravelled. It is this impact that is to be addressed in this article.

THE TRANSVAAL MOUNTAIN REGION

The Transvaal's Mountain region is characterised by rapidly flowing cold streams of high quality and volume, giving them great economic and ecological value. Thus, for example, the Blyde River, which originates in this area, is responsible in some years for the continued flow of the Olifants River in the Kruger National Park. Although the overall annual run-off of the Blyde is much less than that of the Olifants River, it has a much more constant year-round flow. Upstream from its junction with the Blyde the Olifants River has often ceased flowing during winter and spring. It is during these times that the Blyde River has maintained the flow of the Olifants below their confluence and assured its permanence within the Park.

The Mountain region is also characterised by various large conservation areas, especially the Blyde River Canyon and Lekgalameetse Nature Reserves. Also occurring here are the well-known Wolkberg Wilderness Area and a number of other smaller indigenous forests which have been conserved as part of the Forestry Branch of the Department of Water Affairs and Forestry's manifesto. However, there are many land-use practices which, from a conservation perspective, can have an impact on the functioning of natural systems in the area.

Forestry practices

In the Blyde River catchment, especially in the high-lying wetter areas, about 23 000 ha has been afforested since 1931 with monocultures of pines and eucalypts. It is estimated that the replacement of grassland by timber can reduce the run-off equivalent to a 380 mm reduction in the annual

Aggressive growth of silver wattle smother riverine vegetation

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rainfall, and under these circumstances the impact of afforestation is significant. In most instances, however, the effect is less, lying between 152-240 mm, and since 1971 the area of new plantations has been restricted so that only 10% of available annual run-off is used by the trees.

From an ecological point of view plantations use water less effectively than natural vegetation because of their higher evapotranspiration and because of their effect in reducing the soil's capacity to retain water. Thus in areas where forestry has replaced natural plant communities smaller streams cease flowing in winter and their aquatic life is impoverished as a result. The earlier practice of planting exotic trees right up to the edge of indigenous forest also had a negative impact on the edges, and sometimes also the interiors of these forests by the changes in microclimate they brought about. Exotic plantations also have had a variety of other impacts, such as changing the soil chemistry, increasing soil compaction, increasing erosion and destroying sponges.

A major effect of afforestation in this region has been the fragmentation of natural habitats, reducing many of these to isolated islands and thereby threatening the continued viability of many of the populations in these communities. This region's particularly rich biotic diversity is thus at risk today because of afforestation. In recent years, however, the various state and private forestry enterprises have made a concerted effort to minimise the negative impacts of afforestation on the environment: the appropriate legislation has been applied more stringently, revised guidelines for afforestation have been introduced and there has been improved cooperation between conflicting organisations in an attempt to achieve more effective conservation goals.

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River source area with small pans on highveld

Exotic plant invasion

Many of the riparian forests in the Transvaal Mountain region are invaded with aggressive exotic plants such as silver wattle (*Acacia dealbata*), black wattle (*Acacia mearnsii*), poplar (*Populus alba* or *P. canescens*), Lantana (*Lantana camara*), bugweed (*Solanum mauritianum*) and bramble (*Rubus spp.*). In some places these exotics form dense thickets which have replaced all indigenous growth and which have, among other things, reduced run-off in the streams. Their impact on primary production and habitat diversity has also led to reductions in diversity and abundance of the aquatic fauna. Every year thousands of rand are spent by the State and private organisations in combatting the spread of these aliens using mechanical, chemical and biological control methods.

Aquaculture

The high water quality in the Transvaal Mountain region is ideal for the production and angling of rainbow trout (*Oncorhynchus mykiss*). These activities often necessitate the building of many small dams and retaining walls along the streams which change the natural riverine habitat to varying degrees as well as promoting erosion, raising the water temperature and lowering the catchment's water quality. The release of trout and smallmouth bass (*Micropterus dolomieu*) in the Blyde and Treur Rivers nearly led to the extinction of the Treur River barb (*Barbus treurensis*), a threatened species which is endemic to the upper-reaches of this river.

It is thus not impossible that earlier releases of such predatory fish in some of the other small, isolated streams in this region, could have led to extinctions of species not even known to science. The Chief Directorate of Nature and Environmental Conservation's earlier policy of promoting aquaculture was largely

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Highveld river

responsible for the release and spread of several exotic fish species into such river systems. This past policy, which did much harm to indigenous fish communities, has been replaced by one of laying down sound conservation guidelines for aquaculture in the Province, and the chief directorate is today only involved in this activity in a regulatory capacity.

The Highveld Region

The Highveld Region lies west of the Mountain Region between 1200-1800 m above sea-level, and it is drained by the Great and Little Olifants Rivers, the Bronkhorstspruit and the Wilge River. The sources of these rivers usually lie in undulating high-lying terrain in which small pans lie in concave depressions. Some of these hold perennial water and they provide habitat for a variety of waterfowl. They store water like sponges and release it gradually to provide a year-round flow to the Olifants River.

Agriculture

Agriculture is one of the most important land-uses in this region yielding a significant proportion of the country's total crop of maize, potatoes, sorghum and sunflower. Unfortunately poor farm planning has often led to serious damage to the hydromorphic soils in this region. Drainage canals, lands or over-grazing have resulted in erosion of many sponges at the headwaters of the Olifants River, dramatically reducing the perennial flow of these.

In pristine state the Highveld rivers comprised pools with slow-flowing sections of variable depth. Erosion has altered many of these shallow streams, reducing them to deep dongas with sandy or rocky bases and offering poor habitat for fish and other aquatic organisms. This is clearly seen in the upper-reaches of the Steenkoolspruit and Klein Olifants River.

Although the Highveld Region is mainly a dry-land farming area, there is increasing demand for water from the catchment to provide for irrigation farming. Currently 60 million cubic meters of water is used to irrigate 10 340 ha in the region, and projections indicate that this demand will increase to 71 million cubic meters in the next few years.

The main threats from agriculture for the aquatic environment include crop spraying (using herbicides and pesticides), leaching of fertilizers, erosion, siltation, damming and water extraction. The low numbers and diversity of aquatic species in the upper Olifants River can in some cases be attributed to the effects of agriculture.

Damming

The rapid agricultural and industrial growth experienced in this region has led to many dams being built to meet the ever-growing water demand. The three large dams — Loskop, Witbank and Bronkhorstspruit — have a combined capacity of 532 million cubic meters and the region's smaller dams impound another 71 million cubic meters. This combined capacity is already twice the region's mean annual run-off of rainfall. The main effects of damming are on water temperature and flood regulation. Downstream temperatures are cooler in summer and warmer in winter than water temperatures upstream. Damming also changes the physical and chemical properties of rivers, thereby affecting the composition and diversity of the biota, and it can change the timing and duration of flood events.

Mining and Industry

Besides being an important agricultural region, the Highveld also lies in the heart of South Africa's coal mining and power generating industry, coupled with heavy industry associated with this in the towns of Witbank, Middelburg and Bronkhorstspruit. These have reduced water quality and deteriorated the aquatic environment of the Olifants River.

On the other hand there is a growing demand for good quality water for human and industrial consumption. This is being met by transferring water from neighbouring catchments. Such translocations can have negative ecological effects, one being the importation of foreign plants and animals across watersheds. Another is the near-permanent high flood conditions that result in the receiving river which can disturb the breeding or life cycle patterns of the affected aquatic fauna. The moggel,

Water for agriculture

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mosquito fish, and rock catfish are apparently examples of undesirable catchment introductions arising from the Usutu-Vaal transfer. The moggel is endemic to the Vaal River and before this scheme didn't occur naturally in any east-flowing river. Its introduction into the Olifants River would be undesirable because it has the ability of multiplying very rapidly and it may thereby impose a threat to indigenous Olifants River species. The mosquito fish which was originally introduced into South Africa to control mosquitoes is a predator that may impact indigenous fish via their eggs and larvae. The rock catfish is a scarce species endemic to the Vaal River and would be unlikely to pose a problem.

Mining

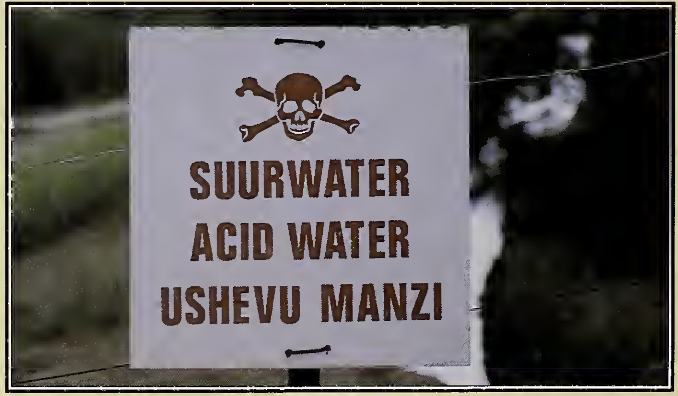
One of the Olifants River's tributaries, the Klipspruit, drains off the numerous worked-out and active coal mines in the Witbank area and it contains high concentrations of sulphate, ammonia and nitrate. It is highly acid, having a pH as low as 2,2 in places. Its aquatic fauna is virtually non-existent as a result, comprising low numbers of midge larvae and water mites. A further tragedy is that the numerous vleis lying in the Klipspruit which have the potential of filtering and trapping the pollutants in this system have to a large extent been degraded or destroyed through land mismanagement.

Acid mine run-off is a serious problem threatening aquatic life throughout the upper Olifants catchment. Furthermore the large farming community located below Loskop Dam and dependent on the quality of water in this system is also threatened, and the viability of irrigation in this district is at stake if a solution to the acidification problem is not found.

To summarise the effects of pollution on water quality in the upper Olifants River, the catchment can be divided into three areas:

1. Above the confluence with the Klipspruit: low quality, slightly alkaline with high concentrations of sulphate derived from coal mines and power station emissions. The fish fauna is low in diversity and numbers and fish are badly affected by parasites. Water quality improves below the confluence with the Klein Olifants River as a result of dilution with cleaner water from the latter.
2. The central section between the confluence with the Klipspruit and the Wilge Rivers. Water quality here is very low, being acidic, with high sulphate concentrations derived from the Klipspruit. Suspended solids in the water create a brilliant blue colour which is noticeable from this confluence for a few kilometres downstream, whereafter the solids become deposited as a sludge on the river bed. The water's very low pH in this section results in the heavy metals, also present in the water (manganese, aluminium, zinc and copper), being particularly toxic. Apart from a few hardy invertebrate species this section of river is devoid of aquatic life.
3. In the section downstream from the confluence with the Wilge River to Loskop Dam the acidic water has been largely neutralised by the Klip River but periodic fish mortalities here indicate that inputs of pollutants can recur in this section. Neutralisation of the Olifants' acidic water results in heavy metals precipitating here. Loskop Dam in particular acts as a sink for heavy metals and these must impact its bottom-feeding aquatic fauna. If acid run-off in the catchment reached such levels that the pH of the water in Loskop dam was raised, then these toxic elements would again be taken into solution with severe consequences for the biota.

The demise of this once flourishing river is simply the result of industry and mining exploiting the environment without a thought for the consequences. In doing so they have degraded the Olifants River to little more than a toxic drain which has virtually destroyed all life along sections of the river and if allowed to continue, will have a major impact on life on a much larger scale. It is essential that accountability and clearly directed planning be implemented if these dire consequences are to be avoided.



The waters of the Klipspruit

J ENGELBRECHT

Acid rain and toxic waters

J ENGELBRECHT

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Opencast coal mining

The heart of South Africa's coal mining industry, the Witbank coal-fields, lie in the upper reaches of the Olifants River. These fields provide more than half the coal mined in the country and the eight power stations which derive their fuel from these mines, generate more than half of South Africa's electricity (11, 12). The impact of this massive industry on the Olifants River is profound and is the subject of this article.

LOCAL IMPACTS

Most coal extraction in the Witbank district is done by opencast mining and the most striking consequence of this activity is the loss of natural habitat: the mines supplying each of the two largest power

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Pollution by opencast mining

stations in the area, Duhva and Kriel, each cover about 4 000 ha (2). Less striking, but potentially far more damaging for the environment, is the effect of mining on water which infiltrates and accumulates in the old workings. Unless controlled, the problem of water acidification arising from this can lead to near-irreparable environmental problems, as described later.

In addition, large amounts of fine coal waste accumulate during mining. The amount of such waste that accumulates annually equals that needed to fuel a large power station such as Duhva (10 million tons per annum) attesting to the magnitude of this accumulation (5).

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Atmospheric pollution by power station

ACID MINE DRAINAGE

As a result of mining coal, minerals such as pyrite which decompose into acid-forming compounds are produced, and these are released into the environment or atmosphere from waste dumps or slime dams. The phenomenon is known as acid mine drainage and it can be chronically or lethally toxic to the aquatic environment, depending on the extent to which it leads to the release of heavy metals into the system (1, 9, 10, 13). Acid mine drainage can be identified by the deposition of a yellow-coloured compound known as iron hydroxide. In some cases where the surrounding rocks are alkali in composition the release of acid into the environment is inhibited as a result of its neutralisation by these rocks and water run-off here is not acidic, though it may be high in sulphates. In the Witbank district, however, alkali rocks are virtually absent, and run-off from mine dumps is invariably acid.

In many cases acid mine drainage only becomes apparent long after closure of the mine, but once it commences it can persist for centuries. In these cases the state has an obvious responsibility to handle the problem. However, in the case of current mining, it should be the responsibility of the companies concerned to ensure that acid mine drainage is prevented from occurring at a later stage.

The acidification of the aquatic environment that has already occurred in the Olifants River has led to a reduction in biotic productivity. Acidification reduces nutrient availability in the system, and it raises the level of dissolved oxygen in the water. This affects the growth of algae which forms the basis of most aquatic food chains. The water becomes clear as a result, enabling sunlight to penetrate to lower levels. Some mosses and algae favour this environment; one of them, sphagnum moss, which is also found in Europe, often grows into dense mats in clear acid waters. Because this plant has a special ability to retard decomposition, it leads to particularly sterile waters.

POWER STATIONS

It is the waste products of coal-driven power stations that have the greatest impact on rivers. Power stations produce two types of ash — fly ash and coarser bottom ash. The fine fly ash comprises about 70% of the ash formed and this fraction goes up the chimney stack. Most of it is retained by scrubbers installed in the chimneys but a small proportion is released into the atmosphere as smoke (13) and this leads to the severe atmospheric pollution found in the eastern Transvaal Highveld (12).

The main compounds emitted into the atmosphere via the chimneys are oxides of sulphur and nitrogen plus minor amounts of heavy metals (12, 13). Trace quantities of radioactive elements such as uranium, thorium and radium are also emitted with fly-ash (13).

According to surveys made in 1983/84 of atmospheric pollution in the eastern Transvaal Highveld, more than one million tons of sulphur

Leaching of salts from mine dump

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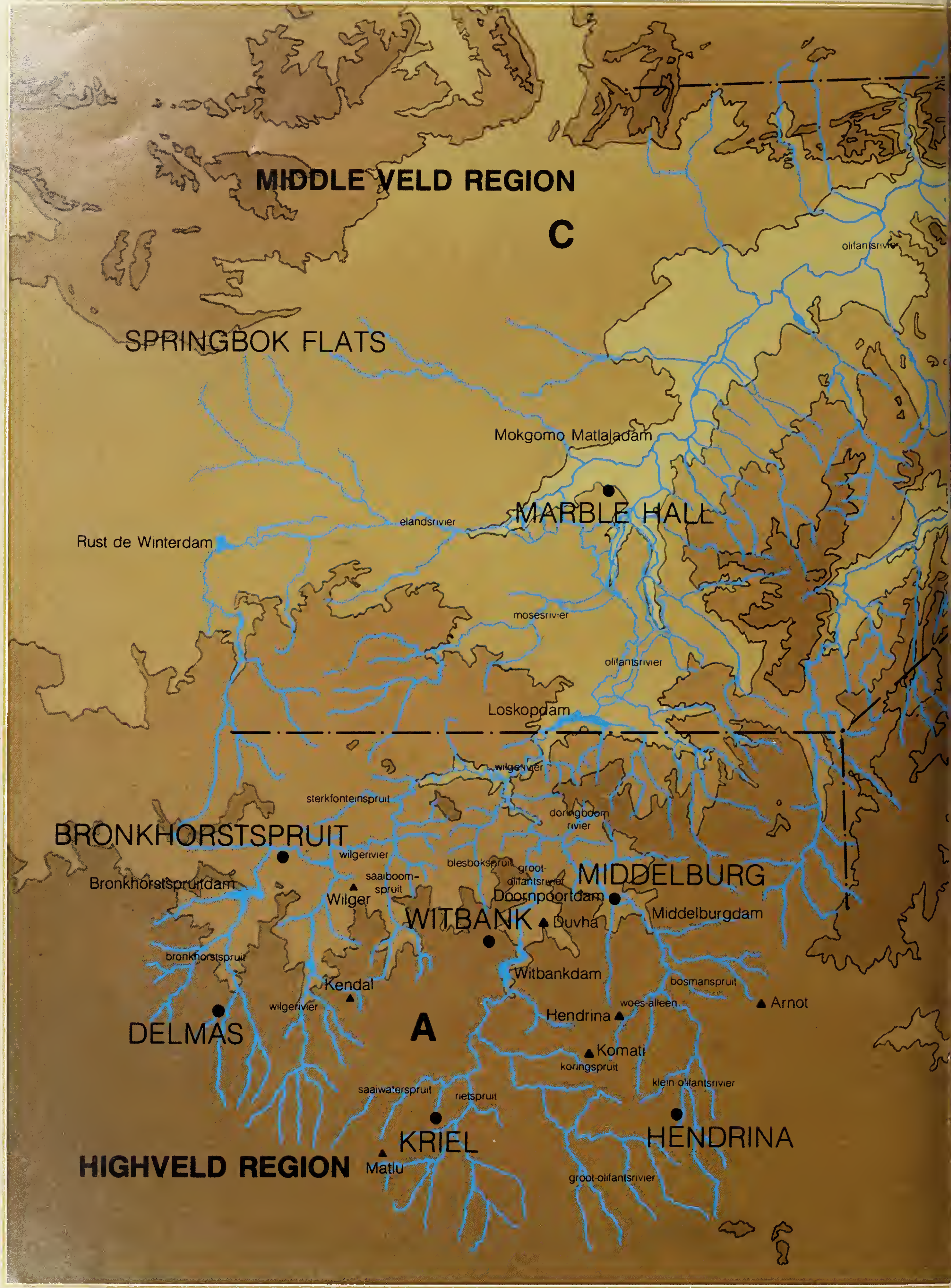
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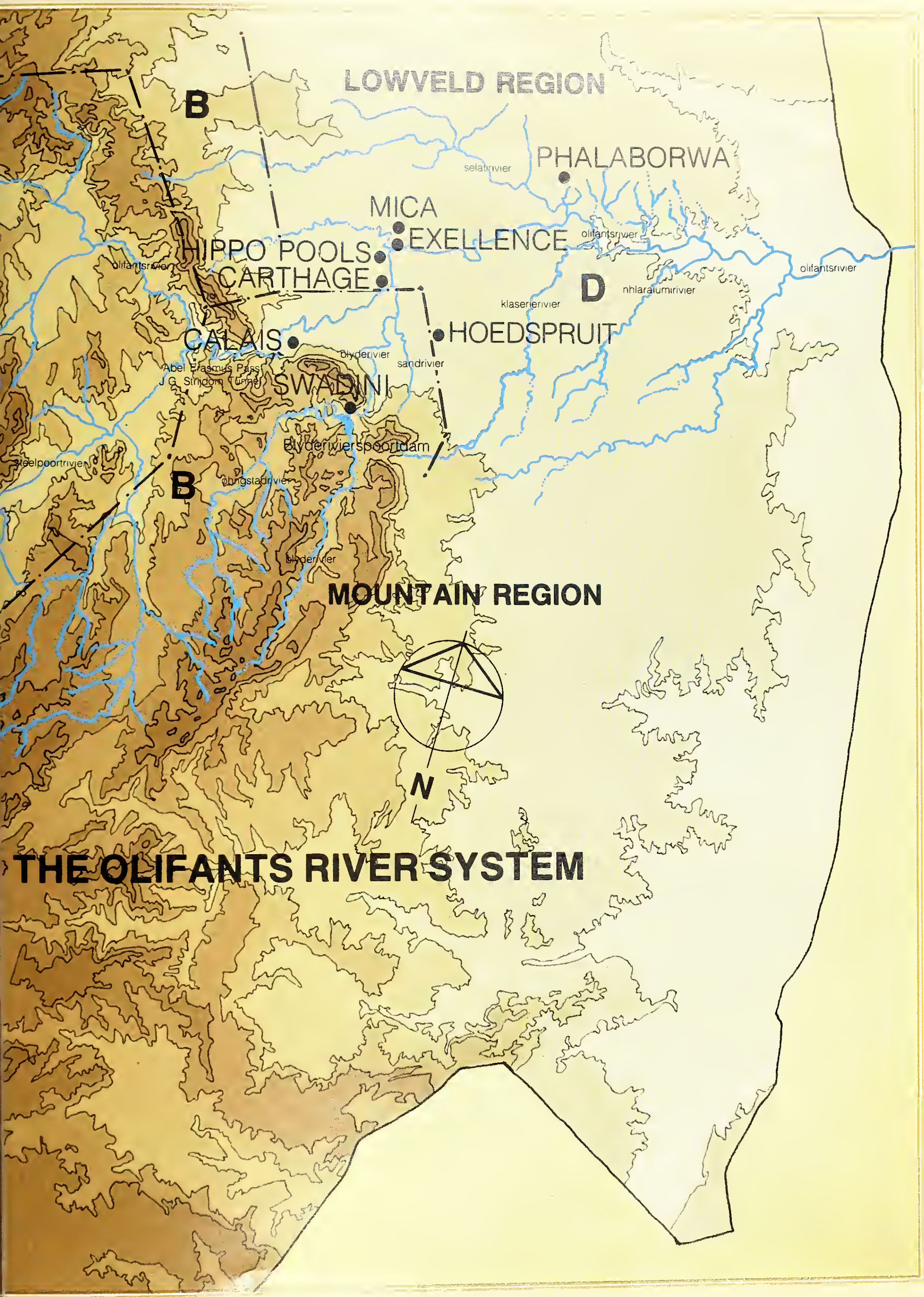
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THE OLIFANTS RIVER SYSTEM

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The Klipspruit polluting the Olifants River

dioxide and about 400 000 tons of nitrogen oxides are released into the atmosphere here annually. These oxides react with moisture in the atmosphere, oxygen and sunlight, to form sulphuric acid and saltpetre which is precipitated as acid rain. The acidity of rain falling in this region is comparable with that found in the most severely industrialised and polluted areas of North America and Europe (12).

Acid rain is harmful to both aquatic and terrestrial environments. It interferes with the physiological processes occurring in plants and reduces the buffering effect and fertility of soils (13). Such rain leaches oxides of silicon, aluminium, sulphur, iron, magnesium, calcium and potassium out of old coal waste dumps and introduces concentrated amounts of these into rivers (13).

HEAVY METALS

In traces quantities most metals are essential to life, but in higher concentrations they can be lethally toxic for plants and man. These elements are released from the earth by weathering processes and they are normally present in aquatic systems in very small amounts. But coal mining and power station chimney emmissions lead to build-ups of these elements in the environment, and to the exposure of aquatic biota to higher than natural concentrations. Aquatic fauna that are exposed to such concentrations accumulate them in their bodies, especially in the fat and liver.

In practice one finds that bottom-living organisms like the mud-fish are more exposed to the contamination because of its concentration in the river bottom. Higher up in the food chain, fauna like the African Fish Eagle and Nile crocodile, are affected because they find these contaminated and debilitated fish easier to catch. It has also been found that different heavy metals have a compounding effect on toxicity; thus copper and zinc,

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The clear polluted Olifants River at its confluence with the Wilge River for example, are far more toxic in combination than individually (1, 13).

Heavy metals interfere with the physiological functioning of organs in fish such as their gills and liver, and this results in osmoregulatory or reproductive disorders (1, 4, 13). It can kill them or lead to chronic disorders in which neurophysiological processes, enzyme- and hormonal balances are impaired, behaviour changes and resistancae to diseases, growth and reproduction is reduced. Deformed growth, cancer and genetic disorders may also result. Most aquatic fauna are especially vulnerable to heavy metal poisoning during the early stages of their life cycle and this coincides with periods of high river flow which is also the time when heavy metals are likely to be at their highest concentrations in the system (1, 13). With respect to aquatic plants, heavy metals, especially copper, zinc and cadmium retard photosynthesis in phytoplankton and thus reduce the productivity and ultimately diversity of aquatic fauna (13).

Large water bodies such as vleis and dams may play an important role in reducing the impact of heavy metals on the aquatic biota. Reedbeds, in particular, are known for their capacity to accumulate and store heavy metals such as zinc, lead, copper, iron, manganese, cobalt, nickel and cadmium (3, 4, 6, 7, 8, 10, 13, 14).

Unless these negative effects of coal mining and power generation in the eastern Transvaal Highveld can be contained, their impact on the Olifants River is likely to increase. Already the river and its aquatic fauna is severely stressed and further deterioration could lead to the final disappearance of all forms of life from this great river.

The polluted waters of the Olifants River looks clear

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From Dammed to Damned

G R BATCHELOR

ALLAN BATCHELOR

JANET MATTHEWS

The spectacular scenery along the Olifants River upstream of Loskop Dam, is best appreciated from a canoe

Over millennia the Olifants River has been incising its passage through the 2 100 million year old sandstones and conglomerates above the present-day Loskop Dam. This awe-inspiring zig-zagging ravine is known locally as "The Hell". Aptly named, this canyon with its 480 m high kranzes guides the river to Loskop Dam. This inspiring scenery forms one of the remote wildernesses of the Transvaal Bushveld. Here Cape Vultures and Black Eagles still find a retreat along with the occasional leopard, brown hyaena and klipspringer.

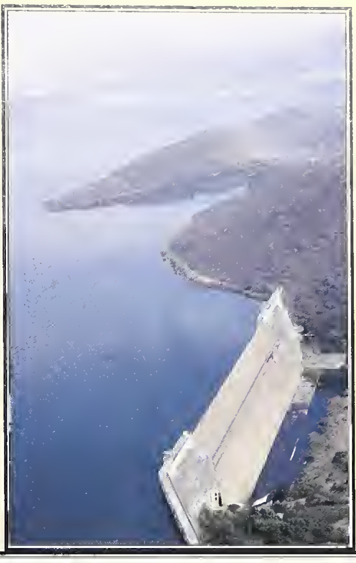
Access to the river in the canyon is difficult. A canoe trip down the gorge during the summer when water levels are at their maximum is probably the best way to explore to this wilderness — at times drifting serenely on a quiet pool admiring the scenery and then struggling moments later to keep upright in the white water of the rapids. A word of warning however: only experienced canoeists should attempt this trip, for apart from waterfalls, large crocodiles may occasionally be encountered in this stretch of river.

At times the water in this section of the river appears deceptively clear. A few kilometres upstream, the Olifants is met by the Klipspruit with its highly acidified water. For over a kilometre below this point the river bed is coloured spectacularly with various salt precipitates. This acid water from the Klipspruit blends with the more alkaline water in the Olifants resulting in this phenomenon but the result of this mixing is still acidic and this water flows downstream. In the summer, this water is diluted by water from the Wilge River, but, in winter, the dilution effect is minimal and the polluted water moves through the gorge into Loskop Dam. Ironically this apparently good quality water is still at times toxic and has probably resulted in fish kills, especially towards the end of winter.

The number of crocodiles in the gorge have diminished dramatically in the past two decades. The cause of their death has not been ascertained despite autopsies performed by specialists from the Veterinary Research Institute at Onderstepoort. There are various theories about the decline, such as poor water quality and lack of food, but to date the cause remains a riddle.

Fish Eagles, like crocodiles, are at the top of the food chain of Loskop Dam. Their well-known cries ring out as the mist rises over the water on a cool autumn morning and have delighted many an angler and visitor to this rugged nature reserve. Unfortunately, being at the peak of the food chain poses unseen, insidious problems. Chemical pesticide specimens collected from Fish Eagle eggs from around the country showed the birds at Loskop dam to be the most contaminated of all. Linked to this was the disturbing fact that the hatching and survival rates of the clutches were also lower. Are these results a coincidence or could there be a correlation between the Fish Eagles, the crocodiles and the water quality?

Loskop Dam was constructed in 1939 by the Department of Water Affairs. In 1977 the dam wall was raised again to provide for its present capacity of 348 million cubic metres of water. The dam was built to supply water to 662 farms below the dam,



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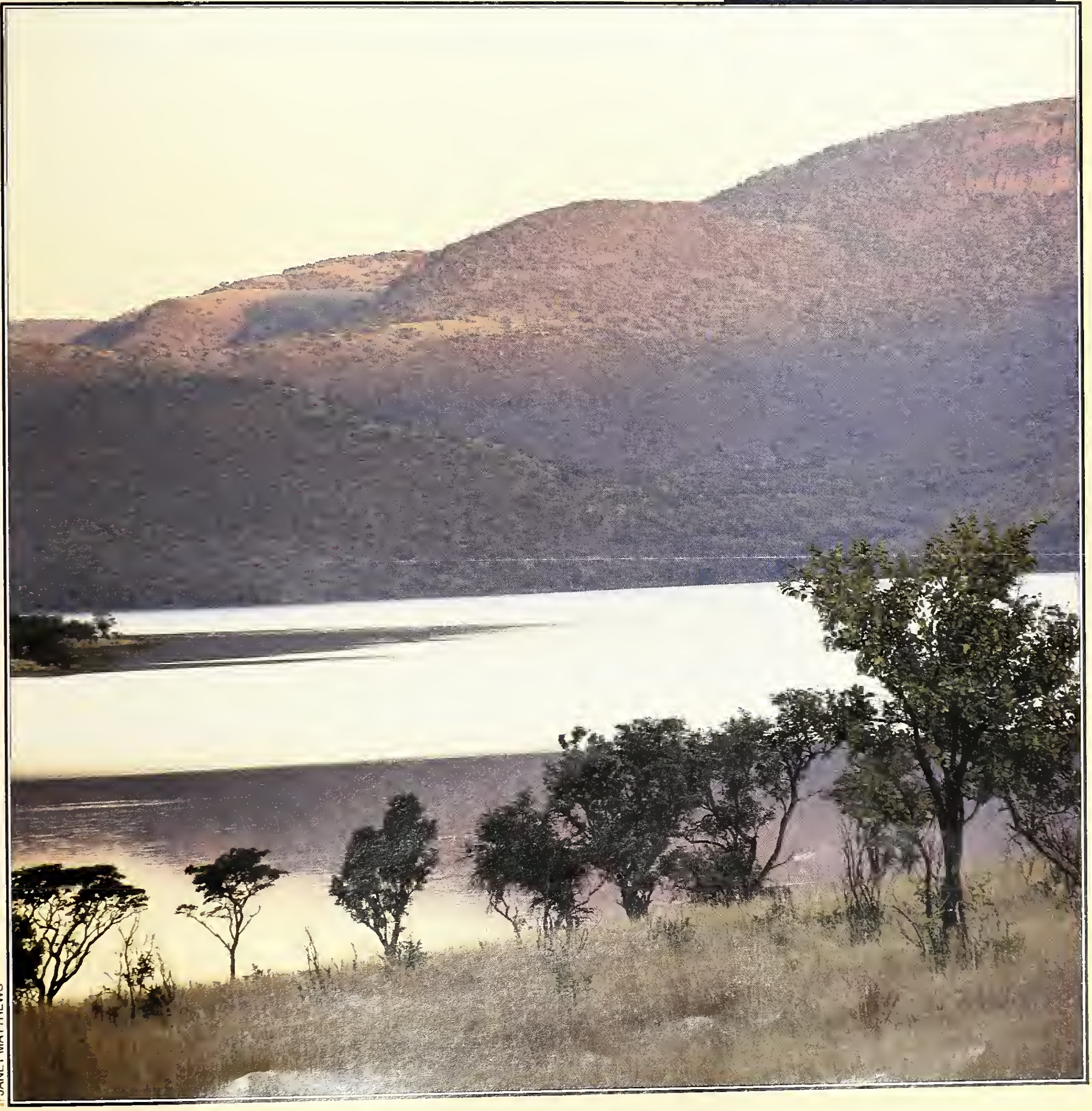
Loskop Dam was constructed in 1939 and provides irrigation water to 662 farms



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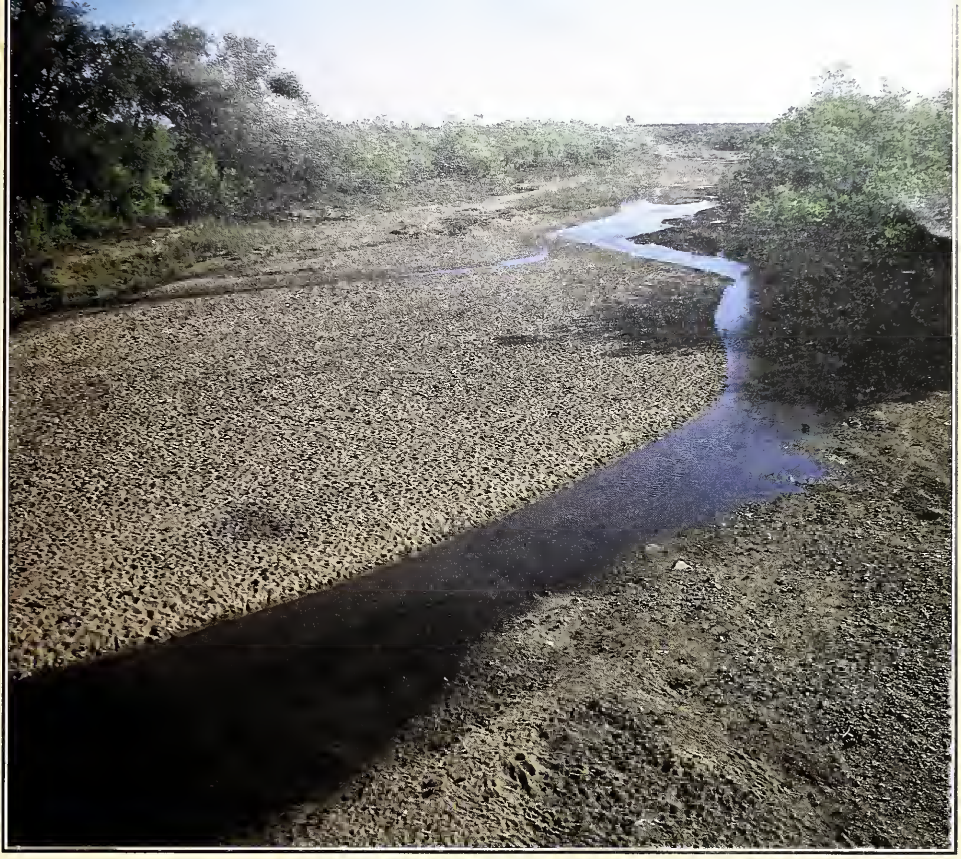
Over 16 000 hectares of agricultural land are irrigated from the Loskop Dam

and currently 16 117 hectares are irrigated from here. On average, 101 million cubic metres of water are released annually into the canal system for the irrigation of various crops. These include citrus (55 000 tons), tobacco (10 million tons), cotton (30 million tons), wheat (60 000 tons), soya beans (7 500 tons), ground nuts (2 000 tons), vegetables (12 530 tons), and seed maize with an approximate market value of 184 million rand per annum.

With the water quality changes recorded in the catchment of the Olifants River and the acidification trends of the water in Loskop Dam, speculation is that the acid water would perhaps eventually corrode the concrete of the already deteriorating canal structure. Irreversible changes brought about in the soil structure and the ability to release nutrients are factors that have been well documented in the case of acid rain. One wonders what the long-term implications of this pollution will be on the irrigation scheme.

Below Loskop Dam the Olifants is a well regulated river characterised by minimum flows. At Marble Hall the Olifants is joined by the Elands River with its two large dams at Rust der Winter and Rhenosterkop. A few kilometres downstream of the confluence the latest dam to be built on the Olifants River is the Matlala Magotlo Dam which was completed in 1988. This dam mainly provides domestic water to Lebowa but 5 000 ha of land can also be irrigated from here.

Like all new dams the Matlala Magotlo Dam is at present biologically productive. As the newly flooded vegetation decomposes so nutrients are released into the water which provides a rich base for phytoplankton and eventually the whole food



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As a result of water abstraction the Olifants River is reduced to a trickle in the late winter

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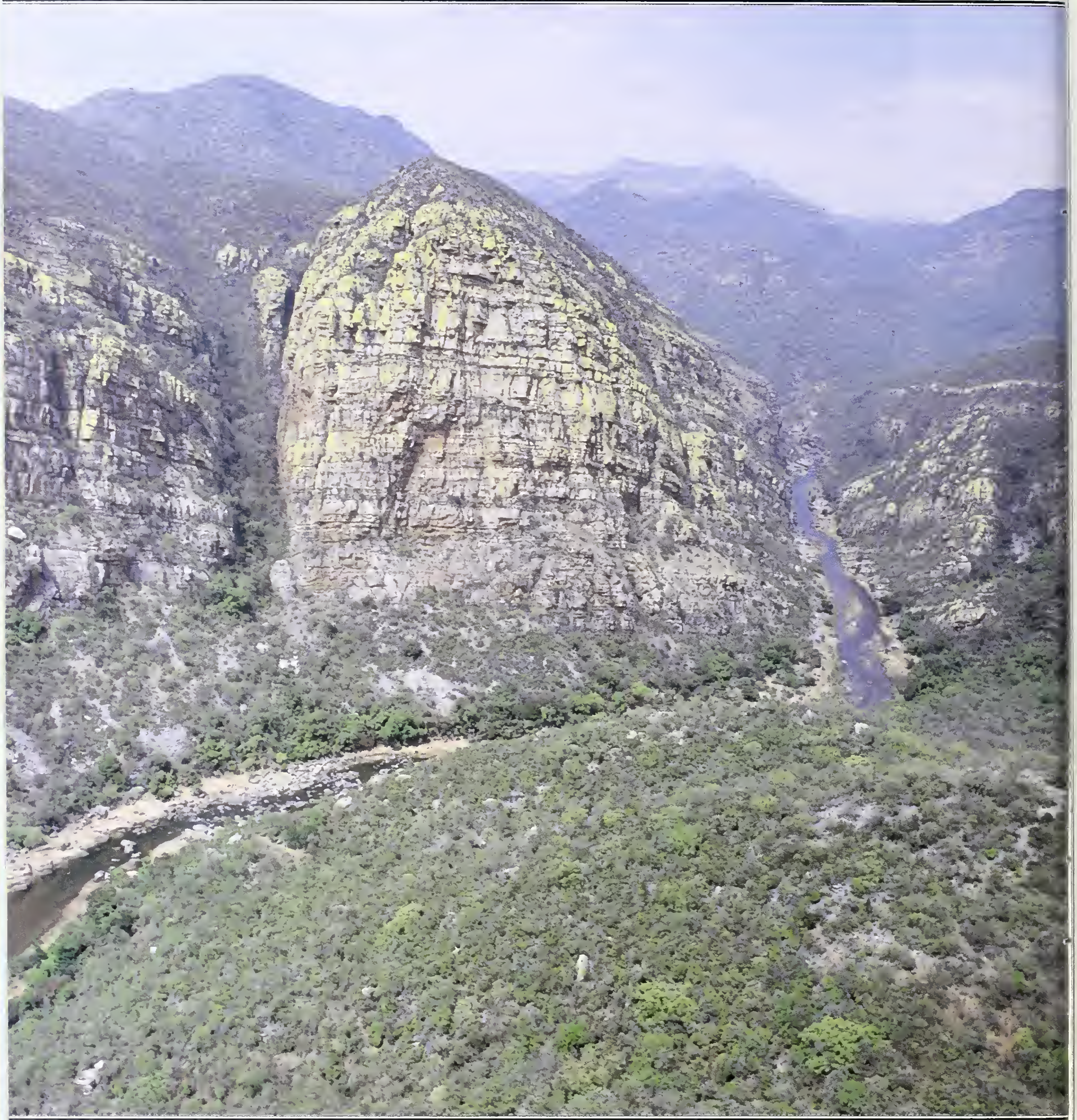
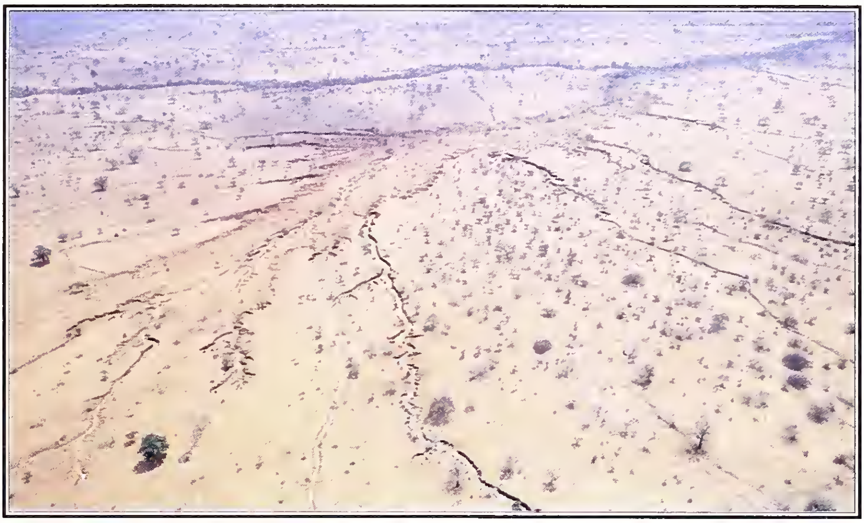


The spectacular butresses at the Abel Erasmus pass, where the Olifants River flows into the Lowveld, have also been considered as a potential dam site



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As a result of overgrazing there is a serious soil erosion in Lebowa which results is the severe siltation of the river in the wet season

chain is stimulated. Fish species such as blue kurper and sharptooth catfish that previously occupied deeper, slow-flowing pools in the river are particularly favoured by having their habitat enlarged. In contrast, the fish and aquatic organisms that are more restricted to flowing water or rapids become severely impacted. Rock catlets, for example, disappear immediately while species such as yellowfish may take longer to do so.

The high biological productivity of the dam is also reflected by the presence of large numbers of fish-eating birds such as cormorants, darters and herons. The Osprey, a migrant from Europe, is also common here in summer. In time, as the dam matures, it is likely that the abundance of bird life will diminish as the nutrients decline, as was the case with Loskop Dam.

The construction of an impoundment in a river has severe implications for the ecology of the system as the dynamics of the river are fundamentally changed. From a system where nutrients move longitudinally downstream they are now trapped and the habitat is changed from primarily flowing situations to predominantly standing water. Rivers are also migration routes for many aquatic organisms and these are also affected by dam walls. Research undertaken at the Lowveld Fisheries Research Station at Marble Hall revealed that there was significant upstream and downstream movements in respect of all the indigenous fish species in the Elands River, from the smallest minnows to mudfish and yellowfish.

Eels have one of the best documented migration patterns of any freshwater South African fish species. The sexually mature adults migrate down rivers to the Indian Ocean and then up to an area north-east of Madagascar to spawn. The ova and Leptocephali larvae drift southwards in the Agulhas current and develop into elvers. When they reach a length of 5 to 10 cm they migrate back up the rivers. The elvers are adapted morphologically to overcome most obstacles on their migration upstream. They have been recorded, for example, to move up waterfalls and even over weirs and dam walls. They must move in a moist environment and appear to migrate at night to avoid predation and desiccation.

The long-term implications of the presence of the Matlala Magotlo and Loskop Dams in the river, as well as the many other small obstructions impassable to most fish, are unknown but could well lead to an impoverishment of aquatic fauna in the Olifants River system. It is for this reason that the various authorities involved in river conservation are seriously considering the possibility and feasability of incorporating fishways in new dam projects.

Downstream of the Matlala Magotlo Dam the Olifants River flows northwards in a well-defined channel suggesting times when much more water flowed between its banks. The once luxuriant vegetation growing along these banks is succumbing rapidly to the demands for fuel by the ever growing human population of Lebowa. However, the largest impact on the river results from the destruction of the vegetation away from the river. It is destroyed for fuel, but mostly, as a result of overgrazing. The grass roots play an important role in stabilizing the soil from erosion by binding the soil together while the leaves lessen the impact of the rain drops. Without the vegetation, the topsoil is rapidly eroded. This countryside is ravaged by chronic soil erosion and the Olifants catchment has not escaped this surge. The washing away of topsoil into the river has made the river very turbid, and the once deep pools are now silted up. This environment is hostile to most species of fish. In winter, the clarity of the water increases but the flow decreases to a small trickle unable to support a significant fish population. To add to the river organisms' dilemma, water is irregularly discharged from the dams to supplement water downstream. These unseasonal discharges may stimulate migrations that are then aborted.

Looking down at the Olifants River from the Abel Erasmus Pass one cannot help but be inspired. The magnificent cliffs and outstanding scenery were all sculptured by this once mighty river as it incised its way through the massive Drakensberg escarpment. Like the canyon above the Loskop Dam Nature Reserve, this landscape was also eroded over millennia. Tragically, the "state of health" of the river has probably in all this time never been lower. This silt-laden, degraded river passing at this point into the Lowveld is the subject of the next chapter.

From Calaise to Dover

W R TARBOTON

JANET MATTHEWS

The numbers of hippo in the Lowveld section of the Olifants River has dropped dramatically (from 305 to 58) in the past decade.

W R TARBOTON

Nesting pairs of Cape Vulture crowd the narrow ledges on the towering cliffs at Manutsa

The Olifants River's last rallying place on South African soil before its flight to the sea is across the Transvaal Lowveld. From its tortuous route through the mountains of the eastern Transvaal escarpment it emerges with a roar from a gorge just north of the Strydom Tunnel to begin threading its way eastwards, reaching the Kruger National Park's boundary after a little over a hundred kilometres and then, another hundred kilometres downstream, entering Mozambique just above the massive Massingire Dam in that country. The river's story in the Kruger Park and in Mozambique is not told in this chapter; here we look at its progress from Calais, where it leaves the escarpment, to the last hippo pools before the park.

The Olifants traverses a very old landscape here, underlain by even older basement rocks — granites, gneiss and schists — which over aeons of time have been exposed as a result of 12 000 m of younger overlying rock being stripped off through weathering. If one looks from the Lowveld westwards to the escarpment, it is hard to imagine that that wall of rock, formed by the sediments and lavas of the Transvaal Sequence, once overlay the whole of the Lowveld and that this seemingly immovable escarpment is still receding westwards as it has been doing over the ages. This line of giant's knuckles, towering 1500 m above the Lowveld plain, slopes upwards in a series of steps caused by the alternating bands of soft lava, which form the shelves, and hard, weather-resistant quartzite forming the cliffs. The thickest (250 m) quartzite band, belonging to the Black Reef Series, forms the highest cliffs on the mountain, and these massive kranzes are the home of one of the largest breeding colonies of Cape Vultures in existence: 600-700 pairs nest here each winter.

The Lowveld is a relatively featureless landscape, smoothed down to gently rolling hills and valleys through which the Olifants River has carved a meandering, broad bed for itself that lies 50-100 m below the surrounding country. In a few places, especially on the farm Carthage, pimple-like inselbergs rear above the plain, formed by intrusive syenitic rocks that are more resistant to weathering than the surrounding granite. Another geological phenomenon of much greater economic significance is the large, six kilometre long, copper ore-body at Phalaborwa. Here, in a huge open cast operation from which 100 million tons of rock are removed annually, 85% of South Africa's copper is mined. The same ore-body is a major source of phosphate, used for fertilizers, and vermiculite. The whole Phalaborwa complex plays a large role in the dynamics of the Olifants system: on the one hand the town and mines here demand a large amount of water from the river, while on the other hand, the huge waste dumps and slimes dams pose a constant threat to the river in the shape of pollution through effluent or silt discharges.

The Olifant's journey across the Lowveld reads like a tour of the ports and capitals of Europe and Britain, from Calais, past Dublin, Edinburgh, Portsmouth, Liverpool and Rome, with Oxford and Cambridge alongside each other at the midway bend where the road and rail links between Phalaborwa and Hoedspruit cross the river. And up the road from here, Dover. Irony, or perhaps the idea of creating an illusion of coolness, must have been the motivation for giving these names to farms in this hot part of the country. Midsummer temperatures along the Olifants are regularly high in the 30s and even reach 43°C on occasion. The region has a warm, frost-free winter and, because of this, is suitable for growing subtropical fruit such as pawpaws, avocados and mangoes. However, the average annual rainfall of 400-500 mm is too low for the cultivation of such crops

W R TARBOTON

Syenite inselbergs dot the old granite landscape where the Olifants River passes through the farm Carthage

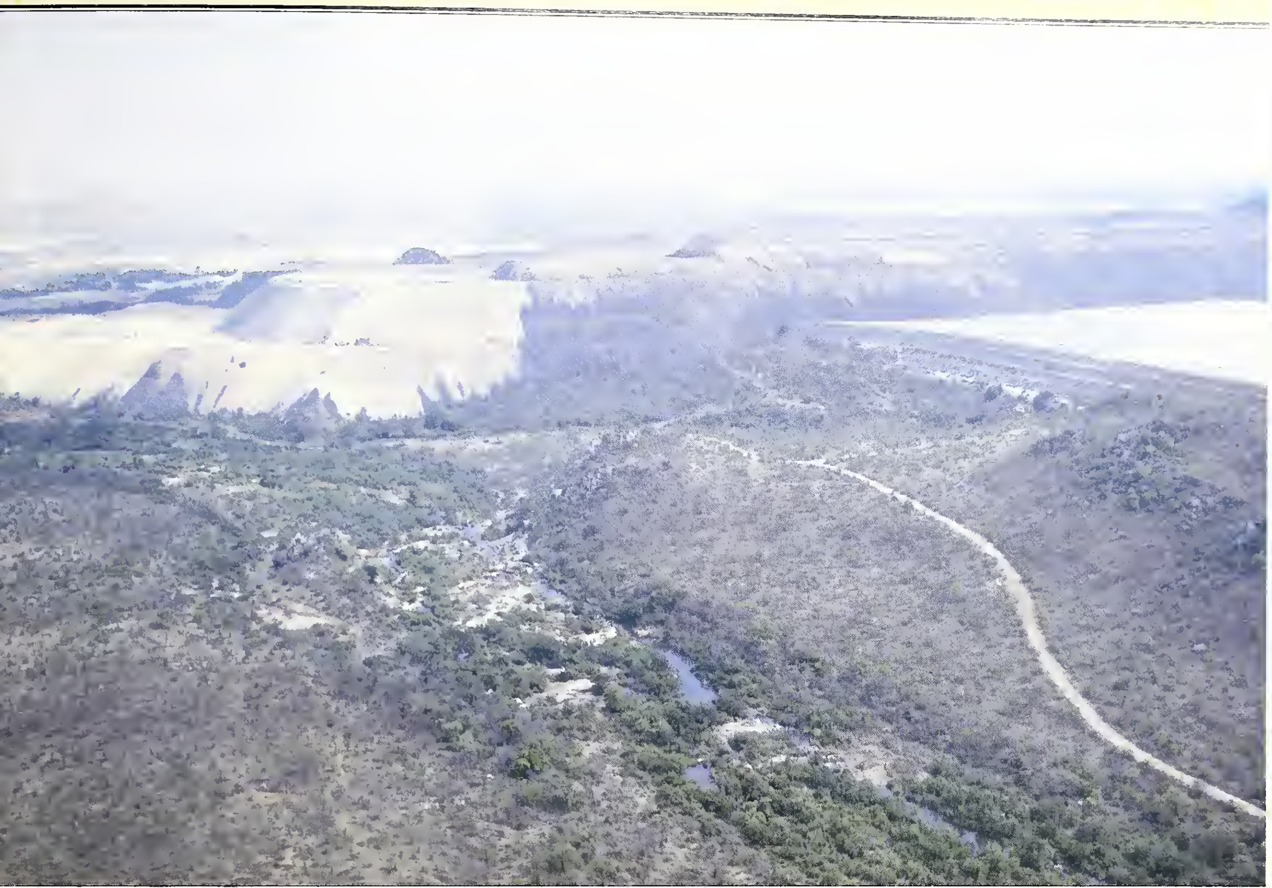
except where irrigation water (and suitable soils) are available. Most of this occurs along the Blyde, and the Olifants itself supports little agriculture.

Instead, the farms surrounding the Olifants River are used for cattle and game farming, north of the river being mainly cattle country (Afrikaner, Brahman and Bonsmara), and the south being mainly game farming country. This is not high-quality ranching country, partly because of the low stocking rate needed (1 large animal unit per 10 ha) and partly because of the tick-borne diseases and the foot and mouth restrictions in force. Game farming has become an increasingly profitable venture in the last decade, mainly because of the high trophy value being attached to animals by hunters. The variety of game exploited in this district represents a shadow of its former glory, but the "Big Five" are still on offer for the few who can afford it.

The elephants that gave the river its name still extend westwards beyond the boundaries of the Kruger National Park into the Klaserie Private Nature Reserve but they are prevented from ranging west from here by an electric fence. Hippo and crocodiles extend much further upstream, reaching the Strydom Tunnel, and recent surveys along this stretch of river put their numbers at 58 and 126 respectively. A decade ago there were 305 hippo in this section of the Olifants. The hippo that remain in the river are found in the larger, deeper pools scattered along the river; one such spot is the "Hippo Pool" on the farm Oxford where the public can observe these gigantic curiosities with ease. Hippo are nocturnal herbivores that use the river as a daytime refuge. At night they graze far afield on land. Fortunately, most landowners like to have hippo on their farms, or are at least indulgent regarding their nocturnal activities, and most hippo in the Olifants' are not threatened from this quarter. Their greater problem is the deterioration of the river and the silting up of their pools.

Fish are probably even more sensitive indicators of changes to the aquatic ecosystems in which they live, and 37 species have been recorded in the

W R TARBOTON



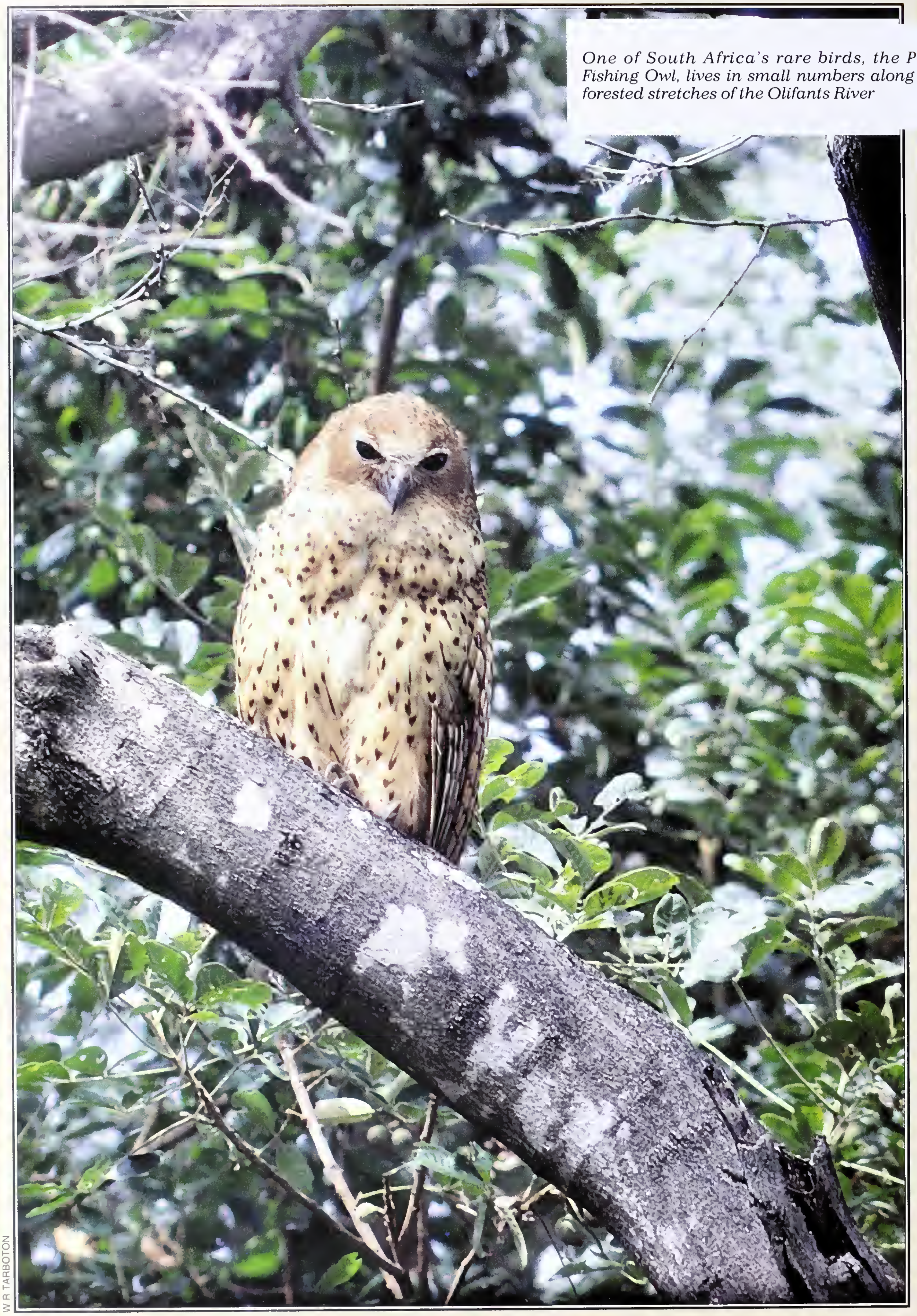
JANET MATTHEWS

The growing mountains of waste material from the Phalaborwa mines threaten to spill over into the Selati River close to its confluence with the Olifants

Lowveld section of the Olifants River. Surveys suggest that both diversity and numbers have declined over the past 20 years. The Red Data species, the barred minnow present in 1969, appears to have disappeared entirely, and the glassfish and dwarf tiger fish have either disappeared or have been greatly reduced in numbers. Several large-scale die-offs of fish, the first in January 1983, have been recorded along the Olifants River in the Kruger National Park as a result of massive discharges into the river of silt from mine dumps at Phalaborwa. This is also a source of further contamination of the river by chemicals, especially sulphates and phosphates, and high levels of these in the downstream stretches are a recurring problem.

In contrast to the distressful situation in the Olifants, the fish fauna of the Blyde River appears to have remained constant. This is surely one of the finest surviving rivers in the Transvaal, with a steady year-round flow of clean, uncontaminated water. It flows out of the escarpment 20 km south of the Olifants' exit, at Swadini, and joins the Olifants 30 km downstream at the boundary between the farms Epsom and Derby where it forms a broad alluvial fan supporting a gallery of magnificent riverine trees. The sight of the two rivers in flood meeting at this junction, one clear and the other boiling with brown mud, explains much about the relative fish populations found in each. Were it not for the Blyde's clean and steady input of water, the Olifants River's lot would have been even more dismal.

The Olifant's flow regime is usually boom or bust, and during booms it carries one of the highest sediment loads of any South African river. Each year thousands of tons of topsoil are swept out of its catchment above the escarpment in Lebowa, and are transported down through the Lowveld and eventually out to sea, silting up the barrages, dams and pools en route in the river, and clogging up the



One of South Africa's rare birds, the Pel's Fishing Owl, lives in small numbers along the forested stretches of the Olifants River

W R TARBOTON

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Large old sycomore figs line the Olifants River, seen here in full spate

JANET MATTHEWS

The Olifants River divides the agricultural lands to the south from the game farming country to the north

pumps of many an irate landowner. The river has probably always carried a high sediment load, since Louis Trichardt referred to it as 'one muddy river' in his diary, but the problem must surely have been exacerbated by the denudation of much of Lebowa through overstocking and agricultural mismanagement. So the fish fauna suffers, and higher up in the food chain the kingfishers, the Fish Eagle and the Pel's Fishing Owl diminish in numbers. Whereas the Olifants River has only two breeding pairs of Fish Eagles along this 112 km stretch, the shorter Blyde River has several.

Probably the most intact and pristine natural communities still found along the Olifants River are the galleries off tall trees that grow where alluvial terraces fringe the river. In such places huge sycomore figs, jackal berries and matumis provide a forest-like canopy that may reach a width of 50 m and may extend over several kilometres. One of South Africa's largest examples of a sycomore fig grows along the Olifants on the farm Excellence, and its dimensions — height 31 m, girth 10,49 m and spread 35,1 m — are recorded in the National Register of Big Trees. These galleries support bird communities that are quite different from those found in the more arid surrounding bushveld. Trumpeter Hornbills are common here, attracted to the figs while African Goshawks and Wood Owls are common predators. In winter these patches support migrants from the colder escarpment forests such as Narina Trogons, Bluemantled Flycatchers, Grey Cuckooshrikes, and many others. The riparian vegetation extending westwards along the river, far beyond the Lowveld, also serves as a conduit for forest-loving bird species to extend their range into the interior. Thus one finds small populations of Tambourine Dove, Spectacled Weaver, Redfaced Cisticola and other species more typical of the Lowveld occurring as far west as Loskop Dam.

The problems facing the Olifants River, now and in the future, are enormous. If it is now a shade of what it once was, will there be anything left of this shadow in the decades to come? How are the demands to be met of all the users dependent on its water, given an expanding group of users and a diminishing water supply? How can the contamination and silt load problem be contained? What of the Fishing Owls and Finfoots and the fish and dragonfly larvae that they live on? A heavy responsibility rests on the various authorities whose decisions affect the river's future, and much hangs on the outcome of the integrated catchment management studies currently conducted by the Department of Water Affairs: these *must* provide answers to the problems and guide-lines to managing the river more effectively.

JANET MATTHEWS

Where to now?

"There is an appointed time for everything, and a time for every affair under the heavens . . . a time to tear down and a time to build"

Ecclesiastes 3: 1 and 3

Although Solomon did not have the sad history of the Olifants River in mind when he uttered these wise words, the sentiments apply: this river has long enough been broken down and the time for its rebuilding has come.

The question is how? How does one tackle such a multi-facetted, complicated and tangled problem? How does one halt the recurring problems and how does one bring about the rehabilitation required?

The first step of the way, naturally, is to identify the problems and then bring them to the attention of the public. The writers have sought to outline the problem areas in the preceding articles and this issue of Fauna & Flora will be widely distributed to achieve the second objective.

Then the task is to bring together those people and organisations affecting and being affected by the Olifants River system, so that the problem areas can be more exactly defined, the players identified, corrective measures formulated and the financial implications of these weighed up. Rehabilitation of the Olifants River will be a long and costly process; it is hoped that this issue of Fauna & Flora will get the ball rolling.

I, as Administrator of the Transvaal, pledge my commitment to try and bring the dying Olifants River back to life. With your help we can win.

In a broader perspective, the Olifants River is but one of many once majestic natural systems that has been brought to its knees by unrelenting and insensitive exploitation of the environment. With the implementation of the Council for the Habitat's proposed Integrated Environmental Management approach to handling environmental issues one can look forward to greater sensitivity being applied when future developments affecting the environment are planned.

ADMINISTRATOR OF TRANSVAAL